ELECTRONICS FOR MEASUREMENT • COMPUTATION • TELEMETRY • CONTROL

INSTRUCTION MANUAL

for

MILLIVOLT CONTROLLED OSCILLATOR

MODELS { GOM-5C-01, GOM-5C-02, GOM-5-03

DCS DATA-CONTROL SYSTEMS INC.

Instrumentation for Research

Commerce Drive, Danbury, Conn. 06810 Telephone: 203-743-9241 TWX 710-456-2596

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_10481

INSTRUCTION MANUAL

MILLIVOLT CONTROLLED OSCILLATOR

MODELS GOM-5C-01, GOM-5C-02, GOM-5-03

This instruction manual consists of the following pages:

Title Page	
Composition Page	A
Front Matter	i to iii
Section I	1-1 to 1-6
Section II	2-1 to 2-3
Section III	3-1 to 3-3
Section IV	4-1 to 4-6
Section V	5-1 to 5-17
Section VI	6-1

This material is the property of Data-Control Systems, Inc., and is furnished for the installation and operation of DCS products only. Reproduction of these contents or use for any commercial purpose without prior permission is forbidden. All rights in this material are reserved.

DOCUMENT NO.: 690812 PUBLICATION DATE: 8/12/69

TABLE OF CONTENTS

Section			Page
I		GENERAL DESCRIPTION AND LEADING PARTICULARS	
	1-1	General	1-1
	1-5	Purpose and Scope	1-1
	1-7	Physical Characteristics	1-2
	1-9	Electrical Characteristics	1-2
II		INSTALLATION	
	2-1	General	2-1
	2-3	Unpacking and Handling	2-1
	2-6	Mounting	2-1
	2-9	Cooling	2-3
	2-11	Lubrication	2-3
III		OPERATION	
	3-1	General	3-1
	3-3	Location and Function of Controls and Monitor Jacks	3-1
	3-5	Operating Procedure	3-1
IV		THEORY OF OPERATION	
	4-1	General	4-1
	4-3	Functional Description	4-1
	4-4	Millivolt Controlled Oscillator, Model GOM-5C-01	4-1
	4-6	Common Mode Amplifier and Floating Power Supply	4-1
	4-7	Pre-Amplifier	4-3
	4-9	Limiter/VCO Driver	4-3
	4-12	Data Monitor Amplifier	4-4
	4-13	Galvo Driver Amplifier	4-4
	4-14	Voltage Controlled Oscillator	4-5
	4-15	VCO Buffer	4-5
	4-16	Band-Pass Filter	4-5

TABLE OF CONTENTS (cont)

Section			Page
	4-17	Output Amplifier	4-5
	4-18	Auto-Cal Control	4-5
V		MAINTENANCE	
	5-1	General	5-1
	5-3	Test Equipment	5-1
	5-5	Preventive Maintenance	5-1
	5-6	Visual Inspection	5-1
	5-7	Cleaning	5-1
	5-8	Minimum Performance Tests	5-2
	5-10	Alignment Procedure	5-3
	5-12	Troubleshooting	5-7
	5-15	Troubleshooting the Pre-Amplifier	5-8
	5-16	Drifting the Front End and VCO of the GOM-5C-01	5-12
	5-18	VCO Temperature Compensation	5-12
	5-19	Front End Temperature Compensation	5-13
VI		DRAWINGS	
	6-1	General	6-1

LIST OF ILLUSTRATIONS

Figure		Page
1-1	Millivolt Controlled Oscillator, GOM-5C	1-0
1-2	Typical Record and Playback System Utilizing the GOM-5C-01	1-3
3-1	Front Panel View, GOM-5C	3-2
4-1	Block Diagram, GOM-5C-01	4-2
5-1	Minimum Performance Tests	5-2
5-2	Alignment Procedure	5-3
5-3	Troubleshooting the Pre-Amplifier	5-8
5-4	Troubleshooting the Pre-Amplifier	5-9
5-5	Troubleshooting the Pre-Amplifier	5-10
5-6	Drifting the Front End and VCO of the GOM-5C-01	5-12
5-7	Master Board	5-4
5-8	Pre-Amplifier Board	5-5
5-9	Galvo Driver Board	5-6
5-10	No Chart	5-15
5-11	Test Chart	5-16

LIST OF TABLES

Table		Page
2-1	Pin Connections, GOM-5C-01	2-2
3-1	Controls and Monitor Jacks, GOM-5C-01	3-1
5-1	Test Equipment	5-1
5-2	Voltages, Common Mode Amplifier and Floating Power Supply	5-8
5-3	Recommended Spare Parts List, GOM-5C-01	5-14

Figure 1-1. Millivolt Controlled Oscillator
GOM-5C

SECTION I

GENERAL DESCRIPTION AND LEADING PARTICULARS

1-1. GENERAL.

1-2. This publication contains information necessary for understanding, operating, and maintaining the Models GOM-5C-01, GOM-5C-02, and GOM-5-03 Millivolt Controlled Oscillators, (Figure 1-1), designed and manufactured by Data-Control Systems, Inc., Commerce Drive, Danbury, Connecticut.

1-3. This information is presented in the following sections; Section I, General Description and Leading Particulars, Section II, Installation, Section III, Operation, Section IV, Theory of Operation, Section V, Maintenance and Troubleshooting, and Section VI, Drawings.

1-4. The GOM-5C-02 and GOM-5-03 are the same as the GOM-5C-01 except for the following:

a. The GOM-5C-02 does not incorporate a galvo driver amplifier.

b. The GOM-5-03 does not incorporate either a galvo driver amplifier or auto-cal circuitry.

Areas of discussion which are not applicable to the GOM-5C-02 and GOM-5-03 will be noted. Refer to the drawings in Section VI for detailed differences between the three models.

1-5. PURPOSE AND SCOPE.

1-6. The Model GOM-5C-01 is a low noise voltage controlled oscillator for conversion of 5 mv to 5 v peak-to-peak signals to an FM carrier or subcarrier for magnetic tape recording or data transmission. The GOM-5C-01 may be used in either a multiplex or a single channel operation. The GOM-5C-01 covers standard center frequencies from 390 Hz to 1.5 MHz, with deviations from ±4% to ±16%. These are determined by the GOM-5/F plug-in tuning unit. The GOM-5C-01 is compatible with low level outputs of strain gauges and thermocouples and has excellent common mode rejection over a

large data frequency range. Special center frequency and gain steps are available. Circuitry included for use with the Automatic Calibration Unit eliminates the need for manual adjustment of unit gain and zero controls of the GOM-5C-01. Incorporated in the GOM-5C-01 is a 100 MA 10 VPP galvo driver amplifier. Figure 1-2 shows a typical system utilizing the GOM-5C-01.

1-7. PHYSICAL CHARACTERISTICS.

1-8. The Model GOM-5C-01 is made up of a basic aluminum chassis which supports the front panel and the main connector board assemblies. The tuning unit, which is housed in a compact lightweight aluminum chassis and cover, slides into the left side of the GOM-5C-01. The weight of the GOM-5C-01 is approximately two pounds and the dimensions are 2.315" wide x 3.29" high x 10.5" long. Each unit fits into a double space of the GMA Module Assembly which provides power and signal interconnections. Up to seven units may be accommodated in one GMA Module Assembly. Each individual unit is locked in place by means of a captive screw located on the front panel.

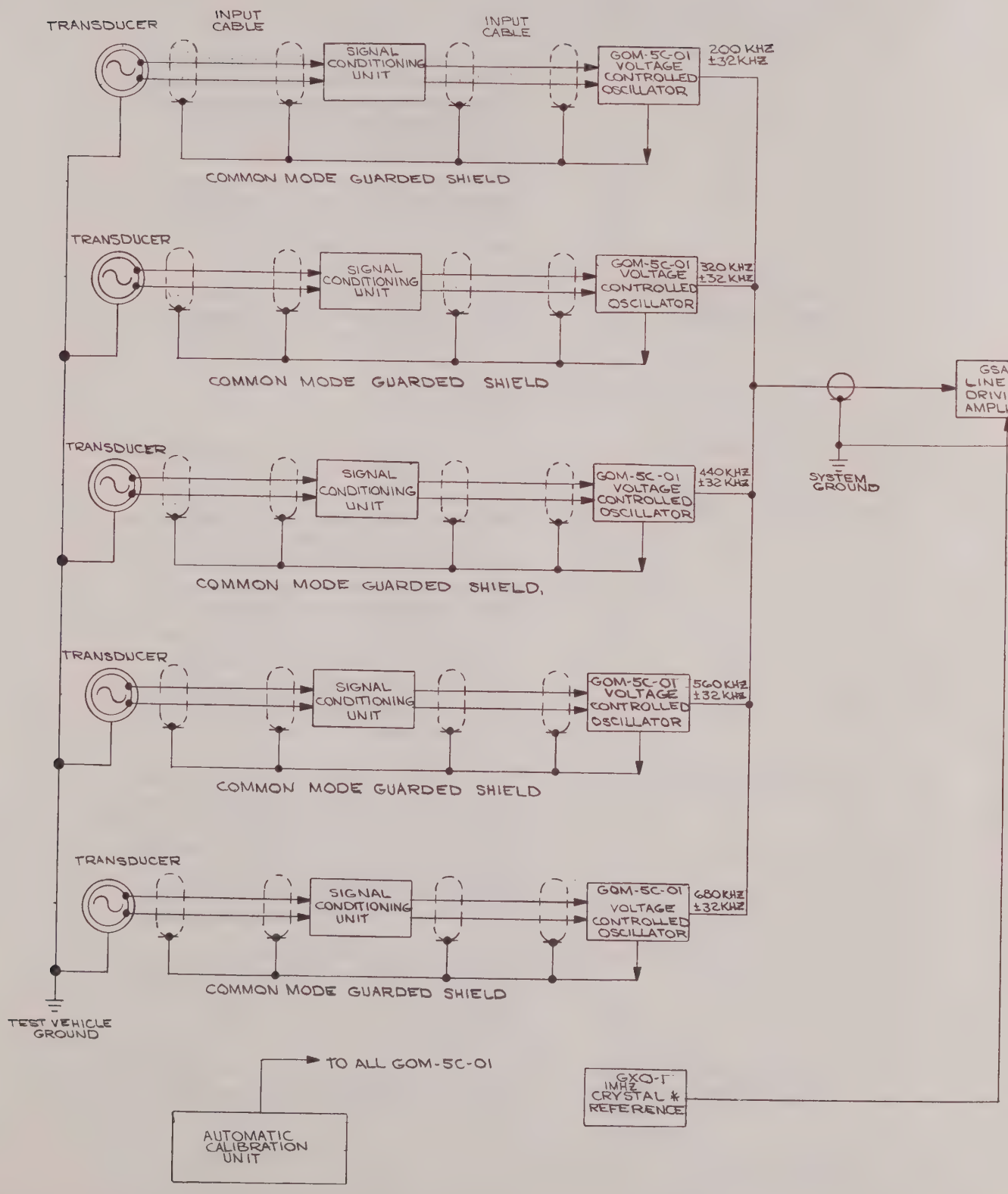
1-9. ELECTRICAL CHARACTERISTICS.

NOTE

Due to the extremely wide range of carrier frequencies and deviations encompassed by the GOM-5 Series of Millivolt Controlled Oscillators, a Maximum and a Normal Operating Range is specified. All performance characteristics set forth herein relate to those channels within the "Normal Operating Range".

Maximum Operating Range:	Channel Frequencies and Deviations:
	Center frequencies from 200 Hz to 2.0 MHz with deviations from ±2% to ±40%.
Normal Operating Range:	Channel Frequencies and Deviations:
	Center frequencies from 390 Hz to 1.5 MHz with deviations from ±4.0% to ±16%.

RECORD ELECTRONICS



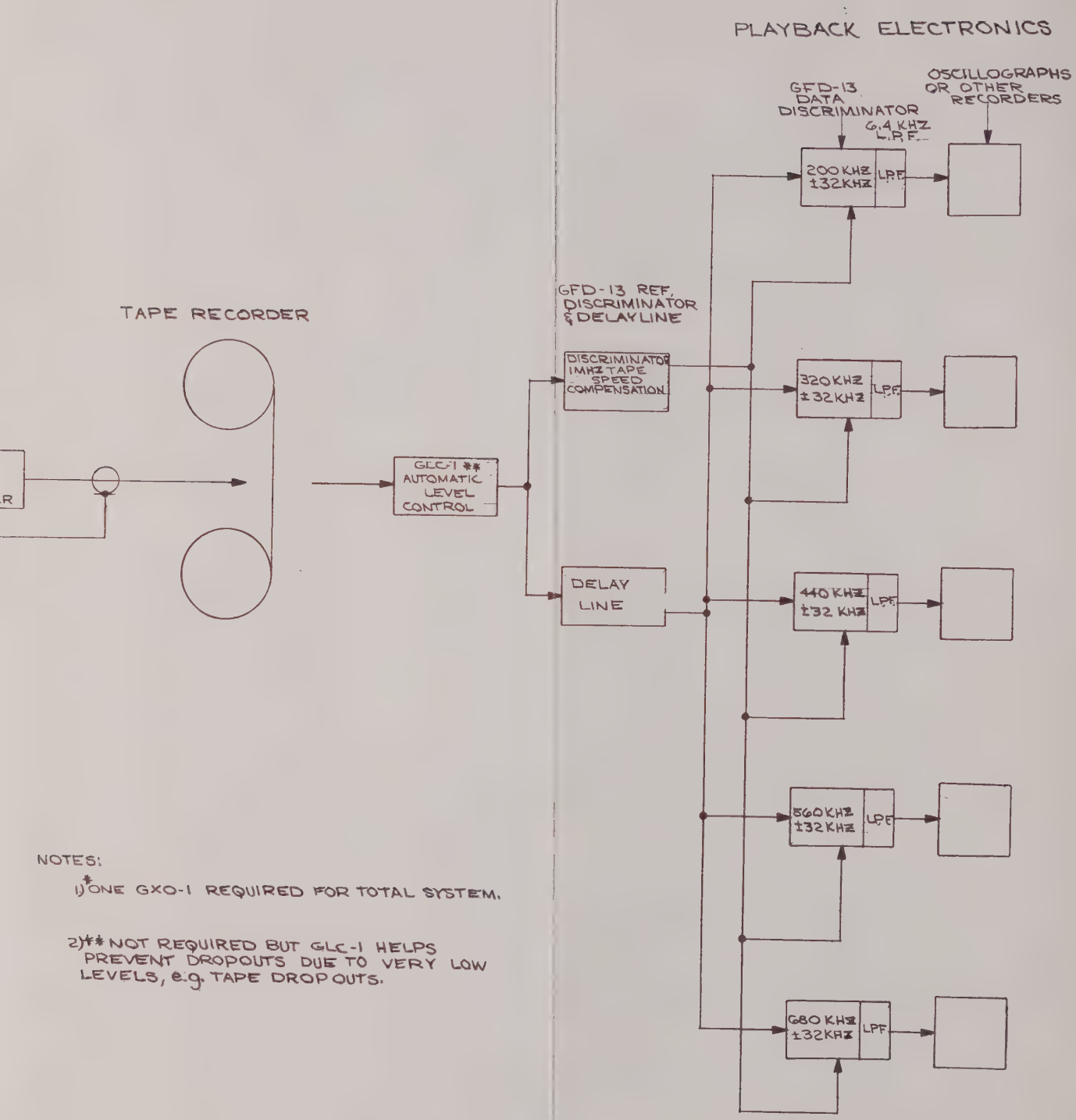
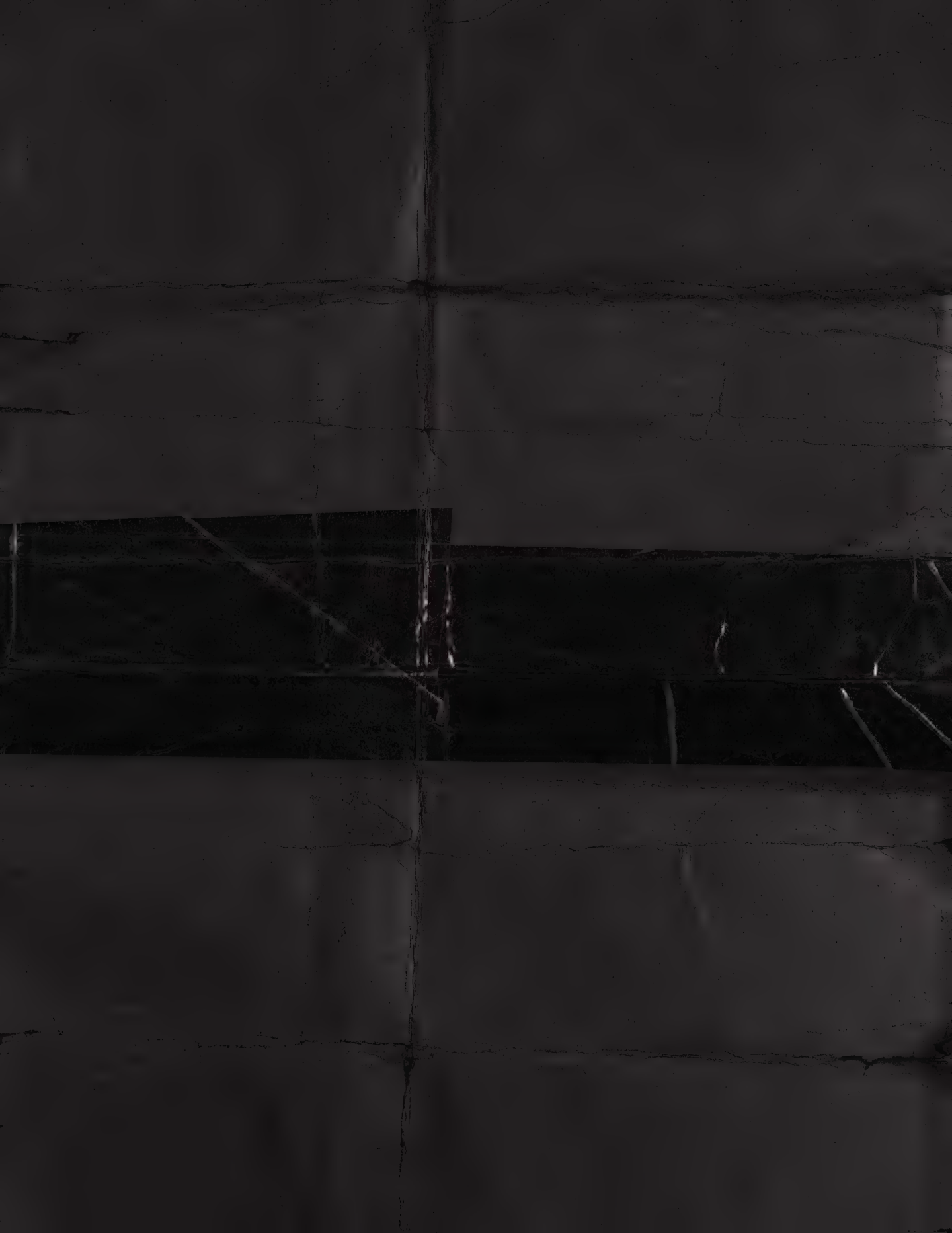

PLAYBACK ELECTRONICS
GFD-13 DATA DISCRIMINATOR
6.4 KHZ L.P.F.
OSCILLOGRAPHS OR OTHER RECORDERS
200 KHZ ±32KHZ
LPF
GFD-13 REF. DISCRIMINATOR & DELAYLINE
TAPE RECORDER
DISCRIMINATOR 1MHZ TAPE SPEED COMPENSATION
320 KHZ ±32 KHZ
GLC-1 ** AUTOMATIC LEVEL CONTROL
DELAY LINE
440 KHZ ±32 KHZ
560 KHZ ±32 KHZ
680 KHZ ±32KHZ
NOTES:
1) * ONE GXO-1 REQUIRED FOR TOTAL SYSTEM.
2) ** NOT REQUIRED BUT GLC-1 HELPS PREVENT DROPOUTS DUE TO VERY LOW LEVELS, e.g. TAPE DROPOUTS.

FIGURE 1-2
TYPICAL RECORD & PLAYBACK SYSTEM UTILIZING THE GOM-5C-01
PAGE 1-3

Figure 1-2. Typical Record and Playback System Utilizing the GOM-5C-01



ELECTRICAL CHARACTERISTICS (cont)

Input Sensitivity:	Ten input ranges are selectable by means of a front panel switch. Overlapping control is provided by a sensitivity GAIN adjustment potentiometer. Full scale, peak-to-peak input voltage ranges are: 5 mv, 10 mv, 20 mv, 50 mv, 100 mv, 200 mv, 500 mv, 1, 2, and 5 volts.
Maximum Operating Input Voltage:	The peak signal plus common mode voltage should not exceed ±10 volts for linear operation.
Gain Step Accuracy:	Within ±0.5% on all but the 5 volt position.
Gain Stability:	Better than ±0.05% for 100 hours.
Common Mode Rejection:	At maximum sensitivity (5 mv peak-to-peak) with line unbalances up to 1000 ohms, the CMR is greater than 110 db for common mode signal frequencies from DC to 60 Hz, - decreasing to 86 db at minimum sensitivity (5 V peak-to-peak). At maximum sensitivity with no unbalance, the CMR is 126 db from DC to 60 Hz, decreasing to 86 db at minimum sensitivity.
Input Impedance:	Each input is isolated from ground by a common mode input impedance of nominally 2000 megohms shunted by 50 pf. The floating differential input resistance is at least four orders of magnitude greater than the common mode input impedance.
Input Polarity:	When input Terminal #1 goes negative with respect to input Terminal #2, the subcarrier frequency increases.
Maximum Safe Input Voltage:	Common mode voltage plus signal of ±60 volts DC, without damage.

ELECTRICAL CHARACTERISTICS (cont)

Input Offset:

Less than 20 picoamps. The differential offset voltage referred to the input is less than 20 μv.

Data Frequency Response:

Input Range Position	Bandwidth (-3 db point)
5 mv	DC to 50 kHz
10 mv	DC to 100 kHz
20 mv	DC to 200 kHz
50 mv	DC to 400 kHz
100 mv	DC to 600 kHz
200 mv	DC to 750 kHz
500 mv	DC to 750 kHz
1000 mv	DC to 750 kHz
2000 mv	DC to 750 kHz
5000 mv	DC to 750 kHz

The bandwidth may be decreased by the addition of a capacitor to the tuning unit module. 3 db points as low as 100 Hz may be obtained.

Deviation Limiting:

Deviation is limited to less than 20% of FBW beyond upper or lower bandedge for a 1000% input overload.

Deviation Linearity:

Less than ±0.05% of full bandwidth from the best straight line.

Output Distortion:

1. Less than 0.5% for any harmonic.
2. Intelligence components are less than 0.1% for modulation indices of 1 or greater.

Output Signals:

(GOM5-03, GOM-5C-02, GOM-5C-01)

1. Filtered FM Output - For summing. Adjustable from less than 50 mv to a nominal 500 mv peak-to-peak, from a floating source resistance of nominally 200 ohms.

(GOM-5-03, GOM-5C-02, GOM-5C-01)

2. Unfiltered FM Output - For driving monitoring devices. Adjustable from less than 50 mv to a nominal 2 volts peak-to-peak, from a 1 K ohm resistive source.

ELECTRICAL CHARACTERISTICS (cont)

Output Signals (cont) (GOM-5-03 and GOM-5C-02. For GOM-5C-01, access is at front panel only.)	3. Analog Output - Permits the input data signal to be directly connected to monitoring devices requiring minimal current drive. The Analog Output is short circuit proof, floating and normalized to 2 volts peak-to-peak (±10%) for full scale deviation, from a 1000 ohm resistive source.
(GOM-5C-01)	4. Analog Output (Galvo Driver) - Permits the input data signal to be directly connected to recording devices requiring a high current source. This Analog Output is single-ended, short circuit proof, and normalized to 10 volts peak-to-peak (±10%) for full scale deviation, at ±100 ma.
Noise:	The equivalent input noise is less than 5 μv RMS, from 10 Hz to 50 kHz, at maximum input sensitivity with a 1000 ohm source impedance.
Temperature Coefficient:	Better than ±2 μv and ±10 picoamperes referred to the input plus ±50 ppm of full bandwidth and ±100 ppm of fc (VCO) per degree centigrade. The VCO drift component becomes less than 50 ppm of fc per degree centigrade when fc is 20 kHz or greater.
Line Stability:	Less than ±0.1% of full bandwidth change for a 10% change in line voltage.
Overload Recovery:	The output of the input amplifier recovers to within 1% of FBW in less than 20 μsec for a +50 volt overload, and within 5 μsec for a -50 volt overload on any gain range.
Auto-Cal:	Adjusts to 0.1% of full bandwidth - both the Zero and Gain Controls.

SECTION II

INSTALLATION

2-1. GENERAL.

2-2. This section covers the procedure for the installation of the GOM-5C-01 prior to operation of the unit.

2-3. UNPACKING AND HANDLING.

2-4. This unit is sealed in a moisture proof polyethelene blister-pack assembly and insulated from shock during shipment with polyurethane foam packing material. There are no accessories or hardware packed with the equipment.

2-5. Remove the corrugated carton and packing material and perform a general visual inspection. Examine the unit for broken controls and indicators and damage to the aluminum case. Retain the carton and protective covering until the inspection is completed.

2-6. MOUNTING.

2-7. The GOM-5C-01 is designed to be mounted in a DCS type GMA Module Housing which contains the power supply and proper wiring for interconnections. Module space designations are printed on the bottom edge of the module assembly rack. To install the GOM-5C-01 in the GMA Module Housing, proceed as follows:

a. Plug the GOM-5/F Tuning Unit into the left side of the GOM-5C-01.

b. Carefully insert the GOM-5C-01 in the designated compartment of the GMA.

c. Tighten captive screw to fully engage rear connectors in the GMA.

2-8. All power and signal interconnections to the GOM-5C-01 are made in the rear of the module through two connectors. The pins, 1 through 20, are numbered from top to bottom. The pin connections and functions are listed in Table 2-1.

Table 2-1. Pin Connections, GOM-5C-01

Pin No.	Description	Pin No.	Description
	Lower Board		Upper Board
1	No Connection	1	Input A
2	No Connection	2	Input B
3	+35 V	3	+35 V
4	+12 V	4	+12 V
5	Ground	5	Ground
6	Low Level MPX Out #1	6	No Connection
7	-12 V	7	-12 V
8	-35 V	8	-35 V
9	+18 V	9	No Connection
10	-18 V	10	No Connection
11	Relay Return	11	No Connection
12	No Connection	12	+1/2 Bandwidth
13	No Connection	13	-1/2 Bandwidth
14	No Connection	14	Center Frequency
15	Spin Zero	15	+ Data or Galvo Out
16	Spin Gain	16	- Data Out
17	Spin Cal.	17	CM Guard
18	MPX Cal. Out	18	Auto-Cal Input
19	High Level Out	19	No Connection
20	Low Level MPX Out #2	20	No Connection

2-9. COOLING.

2-10. Each GMA Module Housing is equipped with a muffin fan which pressurizes the Housing to 0.2 inches of water and forces cooling air over the GOM-5C-01 stabilizing its operating temperature.

2-11. LUBRICATION. If the GMA Module Assembly is used in temperatures exceeding 110°F, or in areas of severe vibration, the muffin fan should be lubricated at least once a year to ensure reliable performance.

NOTE

A hypodermic type oil injector must be used to lubricate the fan. To inject the oil, pierce the label and concealed self-sealing rubber cap located under the label.

SECTION III

OPERATION

3-1. GENERAL.

3-2. This section covers the location and function of operating controls and monitor jacks, initial adjustment and the procedure required to place the GOM-5C-01 in operation.

3-3. LOCATION AND FUNCTION OF CONTROLS AND MONITOR JACKS.

3-4. Controls and monitor jacks are listed in Table 3-1 and illustrated in Figure 3-1.

Table 3-1. Controls and Monitor Jacks, GOM-5C-01

Control/Monitor	Location	Function
MV Input FBW switch	Front Panel	Selects input range for full bandwidth deviation
Zero Control	Front Panel	Adjusts output to center frequency
Gain Control	Front Panel	Adjusts bandedge output frequency
Subcarrier Output Level Control	Front Panel	Adjusts subcarrier output amplitude
Half Bandwidth switch	Front Panel	3 position switch offsetting subcarrier to upper or lower bandedge or at band center
Data + Out Monitor Jack	Front Panel	Monitors + Data
Data - Out Monitor Jack	Front Panel	Monitors - Data
Grd. Monitor Jack	Front Panel	Monitors signal ground
FM Monitor Jack	Tuning Unit	Monitors high level FM square wave

3-5. OPERATING PROCEDURE.

3-6. Refer to Figure 3-1 for the front panel view. To operate the unit proceed as follows:

a. Insert the GOM-5/F into the unit.

b. Insert the GOM-5C-01 module into the GMA housing and set the power switch at the rear of the GMA to the ON position.

Figure 3-1. Front Panel View, GOM-5C

c. Allow a 15 minute warmup period.

d. Select the desired input sensitivity with the MV Input FBW switch.

e. If the input signal is bilateral, set the 1/2 BW switch to CF. For positive or negative unilateral signals, adjust the 1/2 BW to -1/2 BW or +1/2 BW position, respectively.

f. Adjust the Subcarrier Output Level Control to the full clockwise position.

g. Adjust the subcarrier output to center frequency with the ZERO Control, using the Auto-Cal Servo Gun.

h. Using the Auto-Cal Servo Gun, adjust the GAIN Control to the desired deviation sensitivity.

i. Monitor the output of the Galvo Driver Amplifier for a 10 V PP ±10% signal or the Data Out Jack for a 1 VPP ±10% signal for the GOM-5C-02 and GOM-5-03.

NOTE

Manually adjust the ZERO and GAIN Controls in steps g and h for the GOM-5-03.

SECTION IV

THEORY OF OPERATION

4-1. GENERAL.

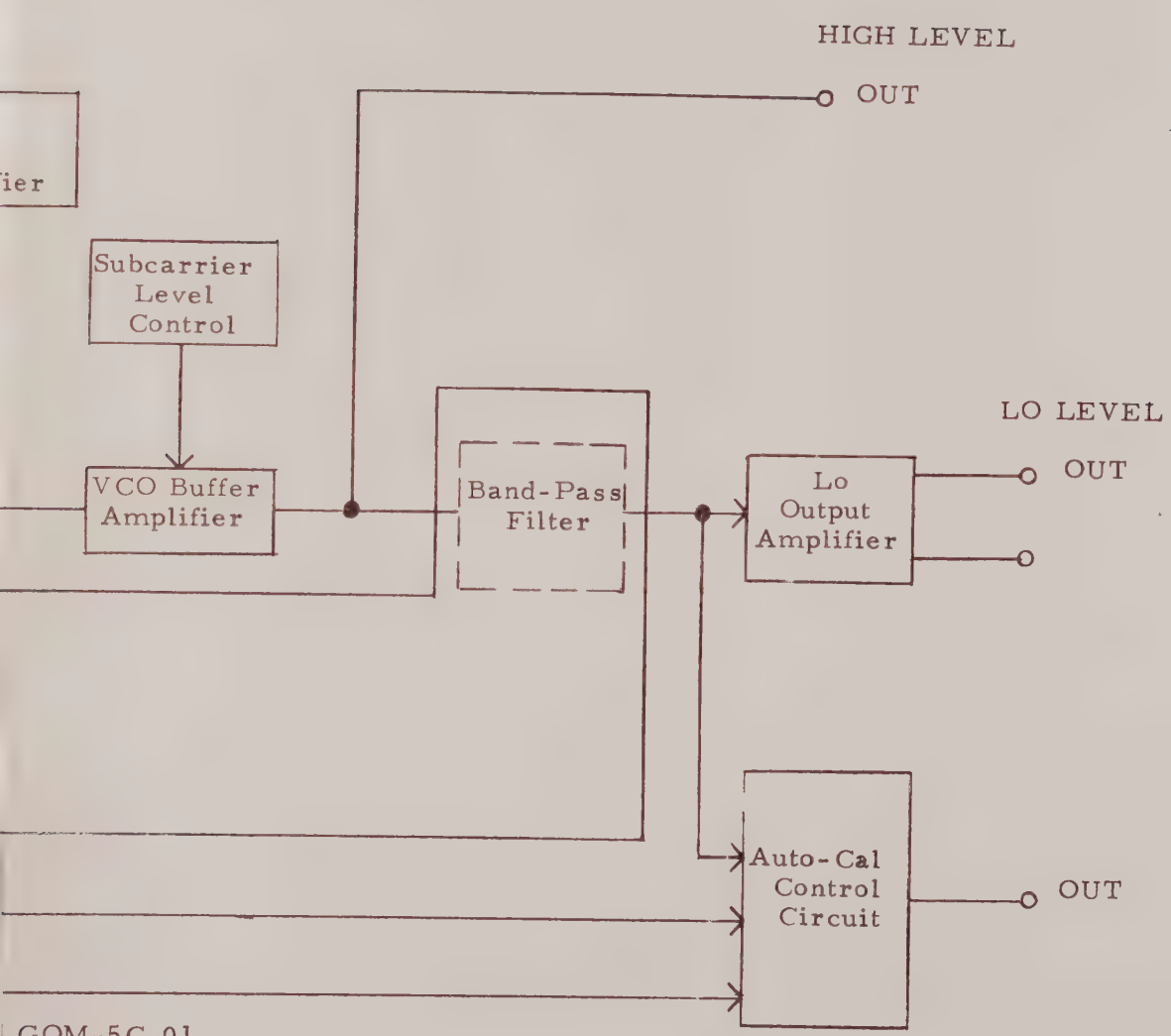
4-2. This section describes the theory of operation of the GOM-5C-01, Voltage Controlled Oscillator with reference to the Functional Block Diagram, Figure 4-1, and Schematic Drawing GW-018675.

4-3. FUNCTIONAL DESCRIPTION.

4-4. MILLIVOLT CONTROLLED OSCILLATOR, MODEL GOM-5C-01. The GOM-5C-01 consists of a Common Mode Amplifier and Floating Power Supply, Differential Pre-Amplifier, Galvo Driver Amplifier, VCO, VCO Buffer, Low Level Output Amplifier and Auto-Calibration Control Circuit. Signals which are differential or single ended may be applied to the input of the unit. A plug-in tuning unit (GOM-5/F) contains the band-pass filter to determine fundamental frequencies within the bandwidth, a timing capacitor to set center frequency, and a deviation resistor to determine bandwidth. The front panel 10-position sensitivity switch selects the gain resistor for input sensitivity and the Auto-Cal calibration input divider resistors.

4-5. The Low Level MUX is a floating sinusoidal subcarrier output and the High Level output is the subcarrier unfiltered square wave. DATA + and DATA - OUT monitor voltages are proportional to the deviation of the subcarrier. A 100 MA, 10 VPP Galvo Driver Amplifier is incorporated for driving galvo recorders and other equipment. The Auto-Cal Control network provides for calibration of the Center Frequency and Deviation Sensitivity of the unit automatically. Compound transistor configurations used in the differential amplifiers and VCO provide high current gain.

4-6. COMMON MODE AMPLIFIER AND FLOATING POWER SUPPLY. The Common Mode Amplifier is a unity gain amplifier which has two (2) output functions. The input is taken from the Pre-Amplifier FET's (Field Effect Transistors), Q212A and B. The FET's are connected by two summing resistors as source followers. The point (R216, R217 junction) which has all



GOM-5C-01

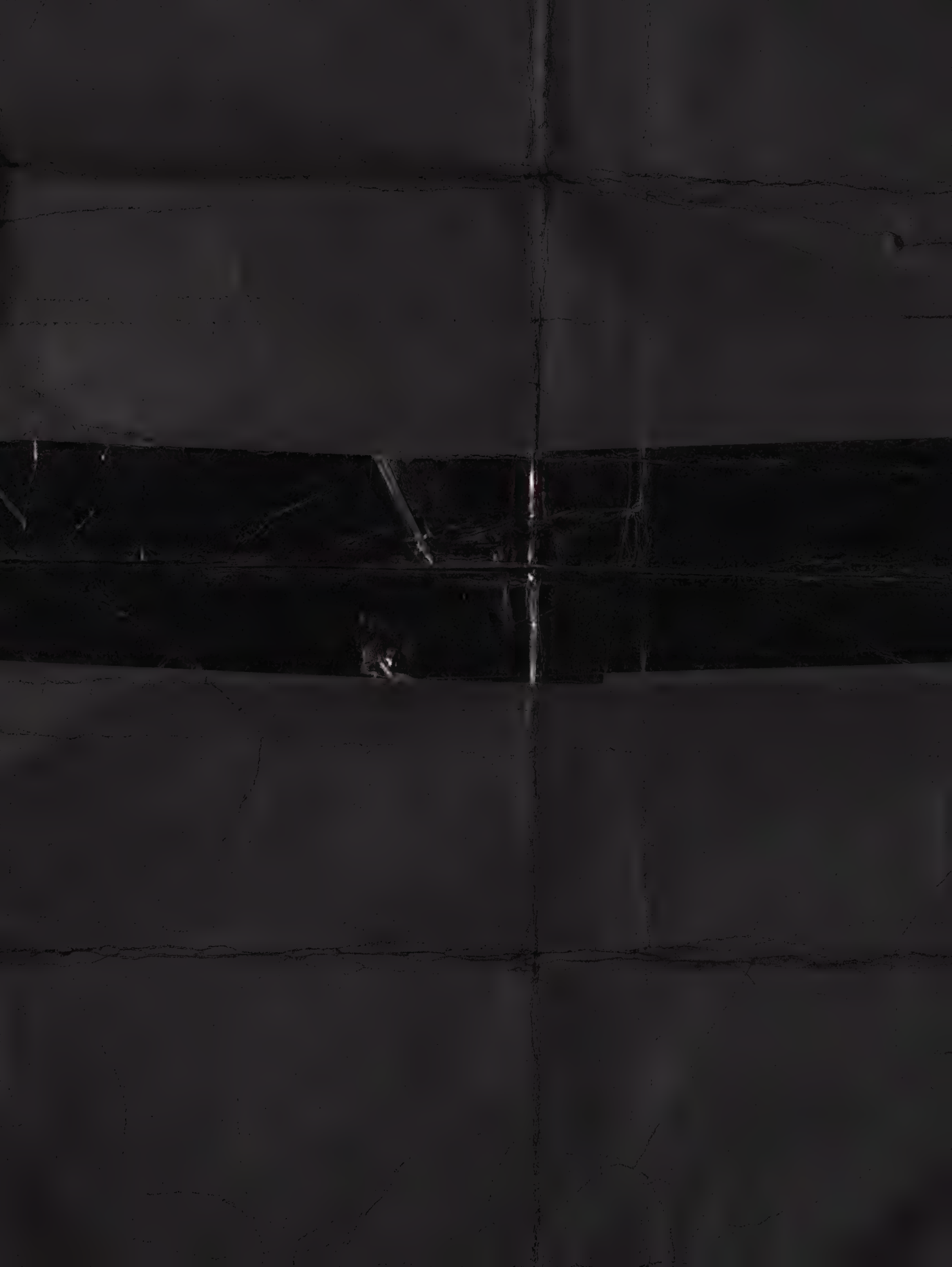
lt Controlled Oscillator

the common mode information on it is applied to the input of the Common Mode Amplifier. The signal is power amplified and its voltage gain is unity. The two functions of the output of the Common Mode Amplifier are to drive the Floating Power Supply which supplies power to the Pre-Amplifier and to drive the shield of the input cable. Both functions are for the same reason; to reduce the apparent common mode voltage to the inputs of the Pre-Amplifier. This also eliminates the effects of stray capacitance and capacitive unbalance in the input cabling. The shield guard is capable of driving a 1 K ohm line impedance, and is effective up to 10 VPP of common mode voltage.

4-7. PRE-AMPLIFIER. The Pre-Amplifier provides high input impedance, low input offset, and low drift. Differential input signals are applied to the gates of the two-matched FET's Q212 A and B. The FET's provide an extremely high input impedance with low noise generation. Each side of the differential amplifier consists of a compound transistor pair fed by an FET drain. This configuration yields high open loop gain, low output impedance, excellent linearity. The 2 K pot (R208) changes the current flowing in the differential sides to minimize DC drift and R215 equalizes the FET gate-to-source voltage to minimize the apparent input offset voltage. The differential outputs are applied across a divider network which includes the GAIN Control.

4-8. The feedback impedance is fixed, therefore, the source resistor, supplied by the MV Input FBW Switch, sets the gain. The MV Input FBW Switch also selects the gain calibration resistors for use with the Auto-Cal System. Since the differential amplifier is a high gain operational type, its gain is determined by the ratio of feedback impedance to source impedance.

4-9. LIMITER/VCO DRIVER. The differential voltage appearing across the GAIN Control network is applied to the inputs of the Limiter/VCO Driver. This differential amplifier consists of 4 pairs of compounded transistors and the current source (Q124 and Q125) which supplies a constant current of 2.2 MA. Limiting action is accomplished when the voltage across the amplifier inputs exceeds the total resistance between the Q128 and Q129 emitters times 1.1 MA; further input signal



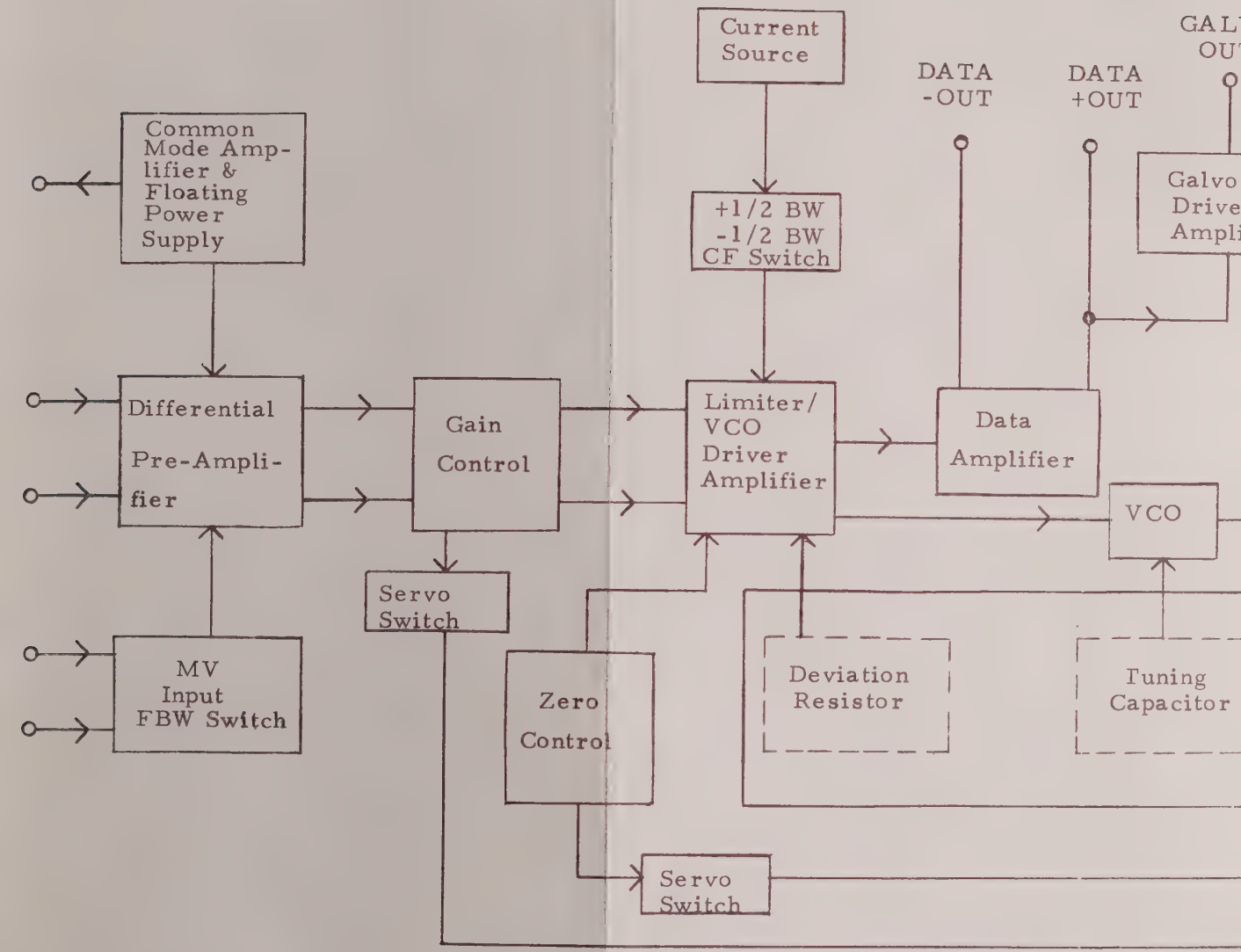


Figure 4-1. Block Diagram, GOM-5C-01

amplification is not possible, and these peaks are therefore limited. The SW-1 Attenuation Switch limits the input signal to the Limiter/VCO Driver only when the MV Input FBW Switch is in the 5000 MV position. Q118 and Q119 are temperature compensating diodes.

4-10. The +1/2 BW, -1/2 BW, CF Switch provides the capability of setting the VCO to center frequency, upper bandedge, or lower bandedge references. When the switch is in CF position, 1.1 ma flows through each side of the amplifier. This current, flowing through R303, the ZERO pot resistance, and R146, produces a voltage at the VCO Input which biases the VCO to run at CF. With the switch set at the +1/2 BW position, unequal currents flow in each side to bias the VCO to upper bandedge frequency with no signals applied. Similarly, the lower bandedge frequency is obtained when the switch is in the -1/2 BW position.

4-11. The deviation of the VCO is determined by the deviation resistor between terminals 1 and 2. This resistor determines the collector load of the differential amplifier and therefore, determines the gain. With higher gain, more voltage swing is produced for a given input signal, and therefore, when this swing is applied to the input of the VCO, greater excursions from CF are produced. With the open circuit, the amplifier would produce maximum deviation and with the short, the amplifier would produce no deviation. The deviation resistor, with values between open and short conditions, determines the limits of the single-ended output voltage of the VCO driver.

4-12. DATA MONITOR AMPLIFIER. This differential amplifier is fed by the Limiter/VCO Driver input stage controlled by the +1/2 BW, CF -1/2 BW Switch. The DATA + OUT and DATA - OUT Monitor voltages are proportional to the VCO frequency deviation.

4-13. GALVO DRIVER AMPLIFIER. The DATA + OUT signal from the Data Monitor Amplifier is applied to the input of Galvo Driver Amplifier. This is a high input impedance amplifier with a gain of 10. It is capable of delivering 100 MA at 10 VPP into a .01 ufd load for driving galvanometers and other recording devices.

NOTE

Paragraph 4-13 does not apply to the GOM-5C-02. Paragraphs 4-13 and 4-18 do not apply to the GOM-5-03.

4-14. VOLTAGE CONTROLLED OSCILLATOR. The single-ended VCO Driver output deviates the VCO frequency. When the VCO Driver output is -24 volts DC nominal, the VCO oscillates at center frequency which is determined by the value of the tuning capacitor between terminals [4] and [5]. Sensitivity of the VCO is a 10% change in frequency for each 0.9 volt deviation from -24 volts DC. The VCO is an astable, free running multivibrator producing a square wave output.

4-15. VCO BUFFER. A buffer amplifier, consisting of Q105, Q109 and Q108, isolates the VCO from successive stage disturbances and loading. A front-panel-mounted LEVEL Control adjusts the square wave amplitude fed to the filter. The high level square wave output at the FM Test Point and output pin 19 is taken directly off the LEVEL Control input to the band-pass filter.

4-16. BAND-PASS FILTER. All harmonics except the fundamental sinusoid of the square wave spectrum are attenuated in the band-pass filter which removes undesired harmonics from the VCO square wave output. The band-pass filter is contained in the GOM-5/F plug-in tuning unit.

4-17. OUTPUT AMPLIFIER. This amplifier consisting of phase splitter Q102 and complementary symmetry push-pull pair Q101 and Q104 provides 160 MV RMS RM sine wave for summing bus application.

4-18. AUTO-CAL CONTROL. This control circuit consists of independent ZERO and GAIN microswitches with relay K1, +1/2 BW, CF -1/2 BW Switch, transistor Q103, and diodes, CR101, CR102, CR103, CR104, and CR105. Communication to the AUTO-CAL system is provided by the SPIN ZERO, SPIN GAIN, SPIN CAL and CAL MPX OUT terminals. When either microswitch is depressed, the relay closes to flag the AUTO-CAL equipment which produces a precise calibration signal into the GOM-5-AUTO-CAL-Servo gun circuit, automat-

ically flagging the adjustment program and activating the adjustment error detector in the AUTO-CAL unit.

SECTION V

MAINTENANCE

5-1. GENERAL.

5-2. This section covers the general maintenance and troubleshooting of the GOM-5C-01 Module.

5-3. TEST EQUIPMENT.

5-4. A list of recommended test equipment to be used in maintaining the GOM-5C-01 is contained in Table 5-1.

Table 5-1. Test Equipment

Nomenclature	Characteristics
Oscilloscope	Tektronix, Model 547 or equivalent
Frequency Counter	Transistor Specialties, Inc., Model 511A or equivalent
DC Power Source	Power Designs, Model 2003 or equivalent
Volt Ohmmeter	Simpson 260 or equivalent
DC Null Meter	Hewlett Packard 419A or equivalent
VTVM	RCA , Model WV-98A or equivalent
VCO Auto-Cal	DCS, Model SMA-10-3, Type 1006
Test Fixture	DCS, Model GTF-3

5-5. PREVENTIVE MAINTENANCE.

5-6. VISUAL INSPECTION. Inspect all sub-assemblies for physical damage such as broken or leaking components, burned or charred spots on components, loose or oxidized soldered wires, and spread or bent connector pins.

5-7. CLEANING. Since cooling air is constantly flowing through the equipment, the main blower rack should be properly filtered. The rack should be cleaned periodically with a standard vacuum cleaner. Panel and covers may be cleaned with a solvent. Interior parts must be air blown.

5-8. MINIMUM PERFORMANCE TESTS.

5-9. The minimum performance tests required to ensure proper operation of the equipment are described in this section. If the unit fails to meet the minimum performance tests, the cause must be determined through troubleshooting procedures. Plug the GOM-5/F into the GOM-5C-01. Insert the GTF-3 test fixture into the GMA Housing and plug the GOM-5C-01 Module into the test fixture. Set up the equipment as shown in Figure 5-1 and proceed as follows:

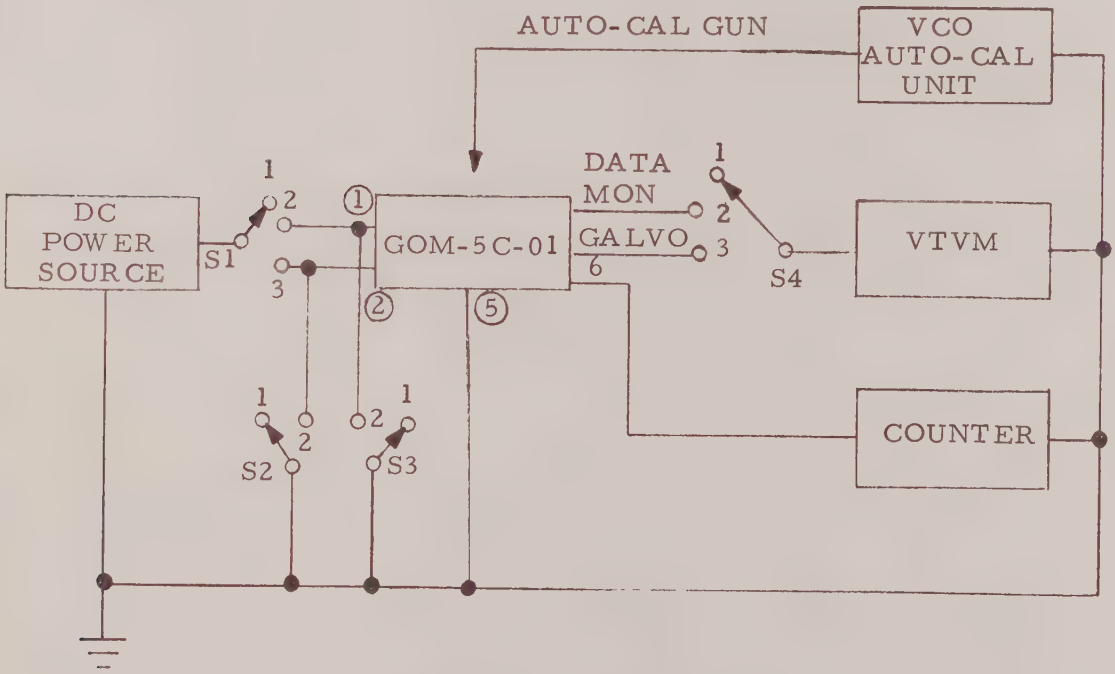


Figure 5-1

a. Set Switch S1 to position #1, S2 and S3 to position #2.
b. Set the 1/2 Bandwidth Switch to CF position.
c. Adjust the Subcarrier Output Level Control full clockwise. (Maximum Output)
d. Using the Auto-Cal Servo Gun, adjust the ZERO Control. A center frequency reading should appear on the Counter.
e. Set Switch S3 to position #1 and S1 to position #2.
f. Set the Input FBW Switch to the 5 MV position. Set the DC Power Source to -2.5 MV.

g. Using the Auto-Cal Servo Gun, adjust the GAIN Control for a high bandedge frequency reading on the Counter.

h. Set Switch S4 to the #2 position and observe a nominally 1 VDC reading on the VTVM.

i. Set Switch S4 to the #3 position and observe a nominally 5 VDC reading on the VTVM.

j. Repeat steps f and g for the remaining 9 positions of the MV Input FBW Switch. Set the DC Power Source to correspond with each switch setting.

k. Using a + DC power source and adjusting the GAIN Control for low bandedge frequency, repeat steps f, g, and j.

l. Set Switch S1 to #1 position, S2 and S3 to the #2 position.

m. Set the 1/2 Bandwidth Switch to +1/2 BW position. Observe a high bandedge reading on the Counter. Set the 1/2 Bandwidth Switch to -1/2 BW position and observe a low bandedge reading on the Counter.

NOTE

Manually adjust the ZERO and GAIN Controls in steps d and g for the GOM-5-03. Omit step i for the GOM-5C-02 and GOM-5-03.

5-10. ALIGNMENT PROCEDURE.

5-11. This adjustment balances apparent Input Offset of the Pre-Amplifier. Insert the GTF-3 test fixture into the GMA Housing and plug the GOM-5C-01 into the test fixture. Set up the equipment as shown in Figure 5-2 and proceed as follows:

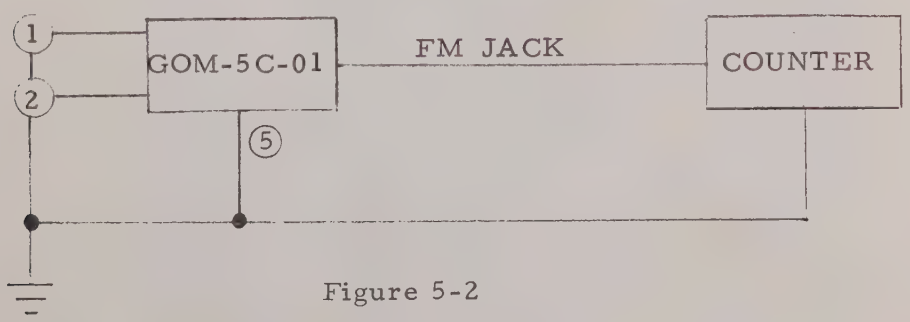


Figure 5-2

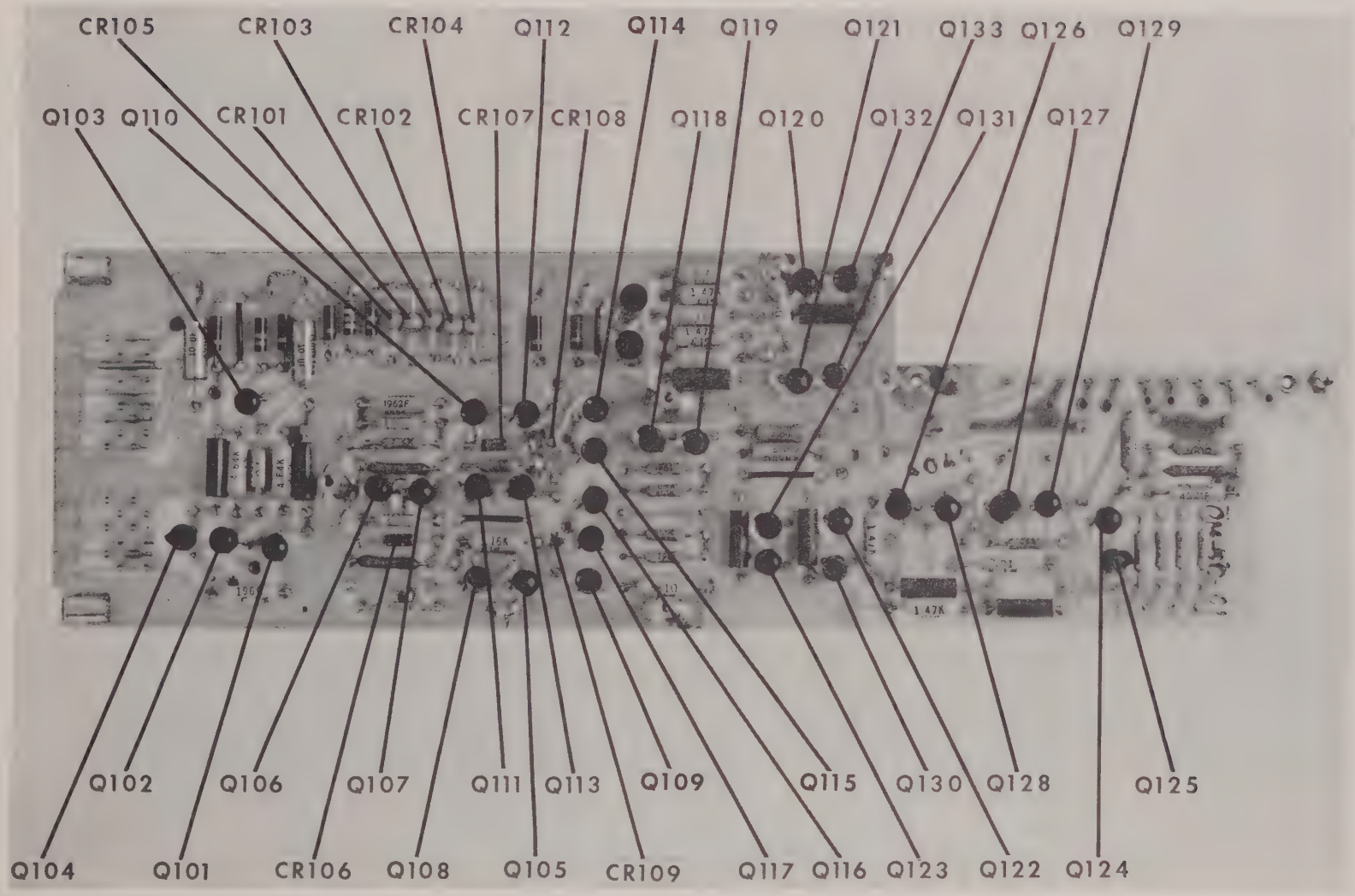


Figure 5-7. Master Board

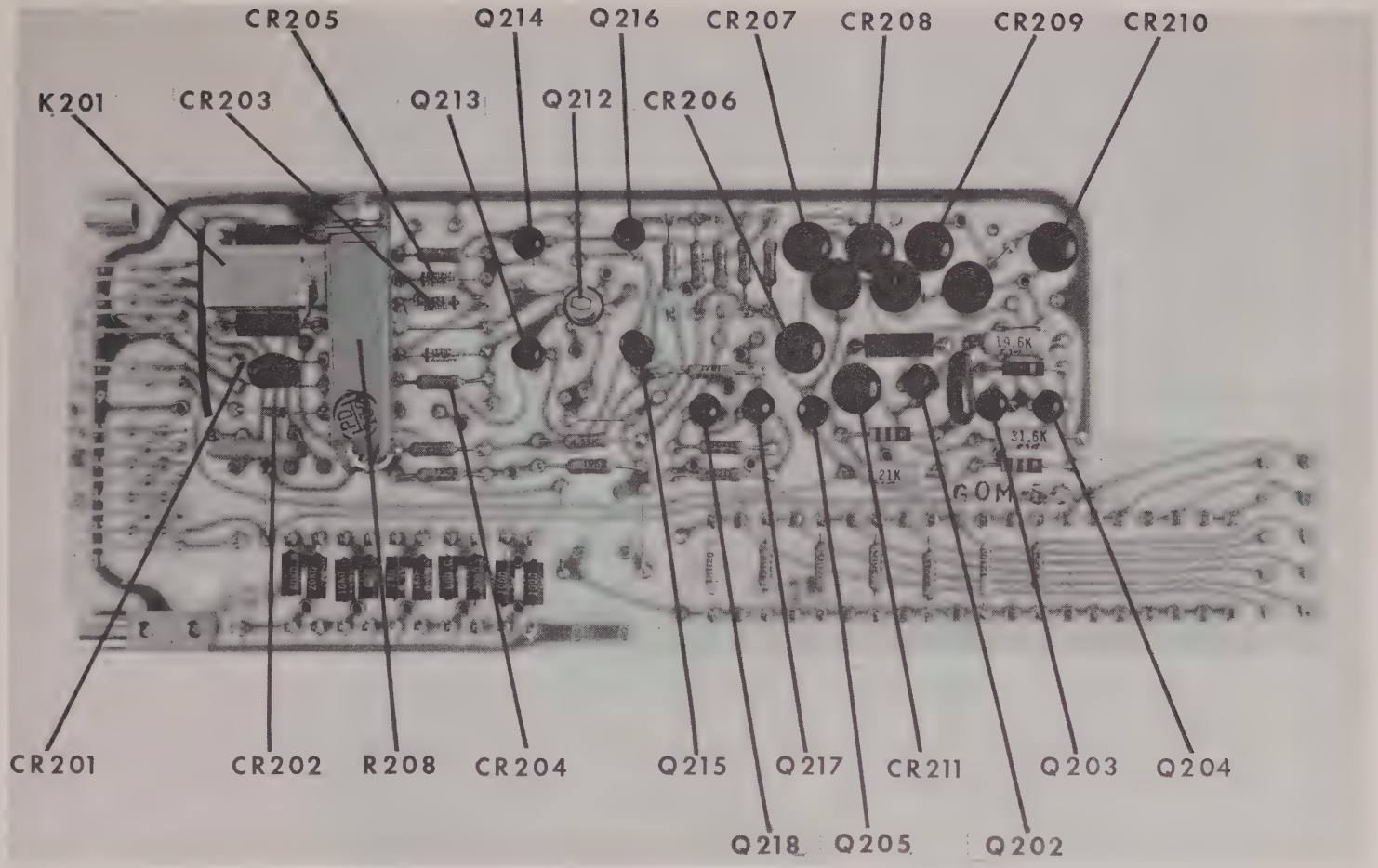


Figure 5-8. Pre-Amplifier Board

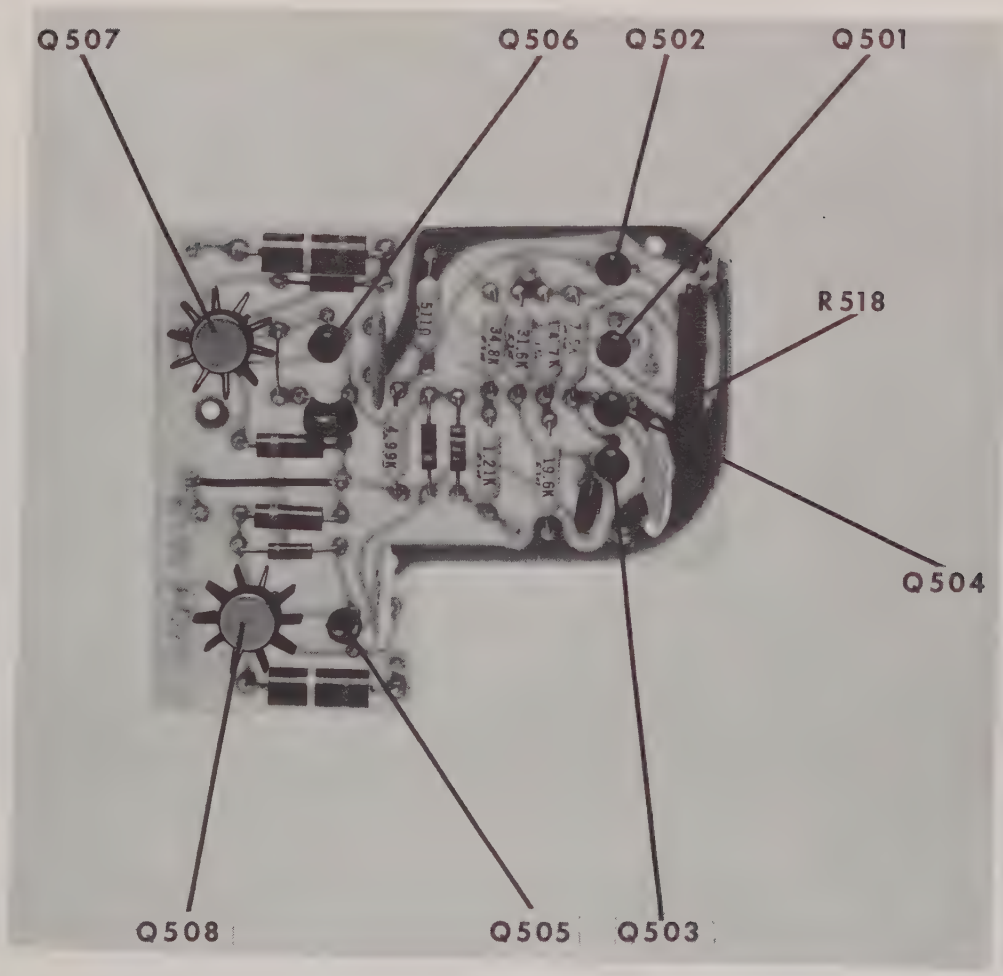


Figure 5-9. Galvo Driver Board

a. Set the Input FBW Switch to the 500 MV position and record the frequency on the Counter.

b. Set the Input FBW Switch to the 5 MV position.

c. Adjust R215 until the frequency is equal to the one recorded in step a (500 MV position).

d. Repeat steps a, b, and c several times to ensure an accurate adjustment.

5-12. TROUBLESHOOTING.

5-13. Troubleshooting the GOM-5C-01 consists of isolating a malfunction to a certain stage and resolving the problem within that isolated stage. A spare known working unit serves as a valuable tool for comparing waveforms. A Test Chart and No Chart are also provided in this section to aid in troubleshooting the unit. Waveforms are shown on the schematic drawings in Section VI. Troubleshooting the Common Mode Amplifier, Floating Power Supply, and Pre-Amplifier (front end) will be covered in detail. Make sure the power is turned off the GOM-5C-01 when making resistance readings and replacing parts.

NOTE

See Figures 5-7, 5-8, and 5-9 for location of the primary components on the Printed Circuit boards.

5-14. Troubleshooting the Common Mode Amplifier and Floating Power Supply.

a. Set the Input FBW Switch to the 500 MV position and GAIN Control at maximum gain (CW). Ground input connector pins 1 and 2.

b. Monitor Test Point A for a voltage $\approx$ -1 VDC ±1 V. If a nominal -1 VDC is observed, the Common Mode Amplifier and Floating Power Supply are all right. If there is not a nominal -1 VDC, proceed to step c.

c. Disconnect the Common Mode Amplifier drive point and ground the base of Q203 and check, in order, the voltages listed in Table 5-2. When the defective component is located and replaced, and all the correct voltages are present, the Common Mode Amplifier and Floating Power Supply are functioning properly.

Table 5-2. Voltages, Common Mode Amplifier and Floating Power Supply

Voltage	Check, If Voltage is Missing
0VDC, Base Q204	Q205, Q204, Q203, Q202, CR211
+6VDC, + Side C205	CR211, Q202, CR210, CR209, Q204
+12VDC, + Side C204	CR211, Q202, CR210, CR209, Q204
-19VDC, - Side C206	CR206, CR207, CR208, Q205, Q203
+28VDC, Base Q202	CR211, Q202

5-15. TROUBLESHOOTING THE PRE-AMPLIFIER.

a. Monitor TP B and TP C (see drawing 018675) for a voltage≈-1 VDC ±1 V. If this indication is correct, go on to step i. If not correct, proceed to step b.

b. Check FET Q212. If the FET is defective, replace it and go on to step c and the rest of the Pre-Amplifier check. After the Pre-Amplifier and the rest of the unit checks out, redrift the unit as described in paragraphs 5-16 through 5-19.

NOTE

When checking the FET Q212, it should appear as shown in the diagram in Figure 5-3. The gate to source or gate to drain resistance in one direction will appear to be a diode. In the other direction, it will have a resistance of higher than 10 kilo megohms (10^{10} ohms). The drain to source, or source to drain resistance will be low, approximately 400 to 1000 ohms. While making this low resistance reading, short the gate to drain or gate to source.

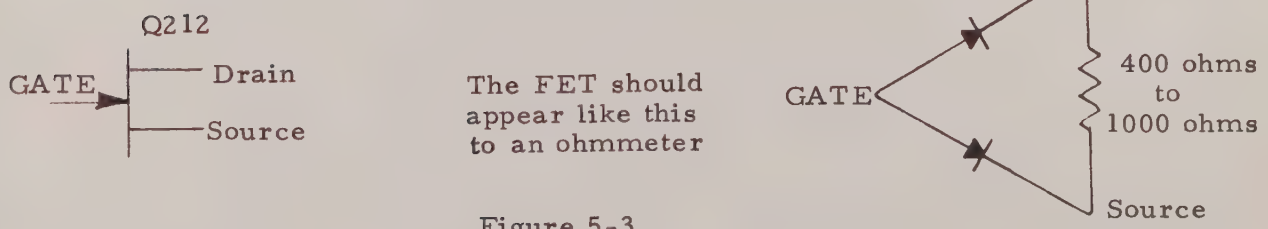


Figure 5-3

c. Check Q213, Q214, Q215, and Q216 and replace any that are defective. Redrift the front end.

d. Monitor TP B and TP C for a voltage≈-1 VDC ±1 V.

e. The voltage reading across TP B and C should balance to within ±15 MV. This is the allowable error limit. Place the DC Null Meter across TP B and C and adjust R215 for a null reading. If no differential indicating device is available, such as a Hewlett Packard 416A-DC Null Meter, use one of the alternate methods described in steps f and g.

f. To use a Discriminator instead of a Null Meter, set up the equipment as shown in Figure 5-4 and proceed as follows:

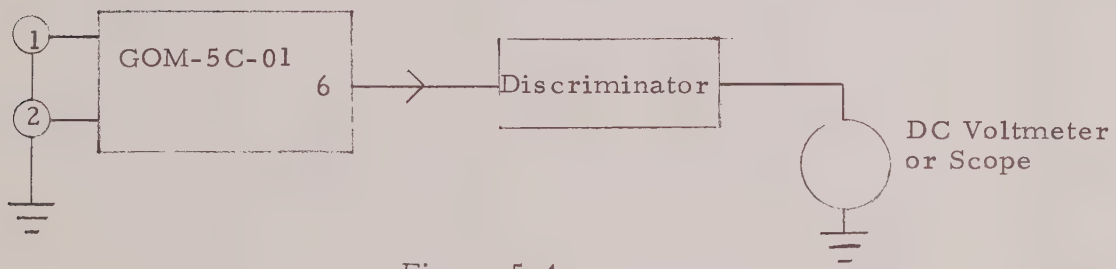


Figure 5-4

1. Use the following method to calculate the maximum unbalance output volts at the discriminator; at TP B and C, 2 Volts peak-to-peak corresponds to a full bandwidth signal. ±15 MV is the maximum allowable error. Set up the maximum error in a ratio with the full bandwidth signal to determine the allowable error from the discriminator. (See step 2.)

2. $$\frac{\text{Allowable Error at B, C}}{\text{Full Bandwidth Signal B, C}} = \frac{\text{Allowable Error Disc}}{\text{Full Bandwidth Signal Disc}}$$

3. The following is an example using a DCS Model GFD-13 Discriminator on the output of the GOM-5C-01.

$$\frac{\pm 15 \text{ MV}}{2000 \text{ MVPP}} = \frac{\pm X \text{ MV}}{20000 \text{ MVPP}} \qquad X = \pm 150 \text{ MV Allowable Error Limit}$$

4. If 5 V PP was the maximum output of the discriminator, the example would be as follows:

$$\frac{\pm 15 \text{ MV}}{2000 \text{ MVPP}} = \frac{\pm X \text{ MV}}{5000} \qquad X = \pm 37.5 \text{ MV Allowable Error Limit}$$

g. To use a Counter instead of a Null Meter, set up the equipment as shown in Figure 5-5 and proceed as follows:

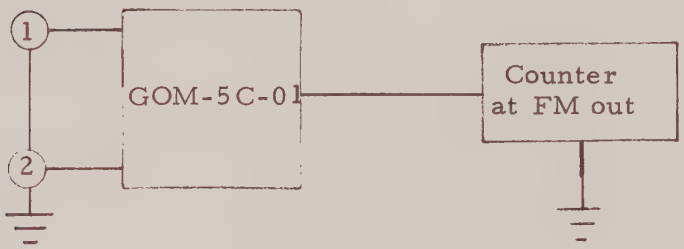


Figure 5-5

1. We know three things and would like to know a fourth. We know that 2 V PP is equal to full bandwidth input at TP B and C. We know that the GOM-5/F Plug-in is plus and minus so many kHz which is equal to full bandwidth input. Therefore, 2 V PP = FBW = ±NKHZ. We know our allowable error is equal to ±15 MV at TP B and C.

2. Therefore, $\frac{\pm 15 \text{ MV}}{2000 \text{ MV}} = \frac{X \text{ kHz}}{\pm 4 \text{ kHz}} = \frac{X \text{ kHz}}{8 \text{ kHz}} = \frac{X \text{ Hz}}{8000}$

   $X = \pm 60$ Hz Maximum Allowable Error

h. Using one of the above three setups, balance the Pre-Amplifier as follows:

1. Set the Input FBW switch to the 500 MV position. Zero all of the instruments, e.g., null the DC

Null Meter or zero the discriminator or adjust center frequency to band center.

2. Switch to the 5 MV input position. Adjust R215 to equal the readings in step 1 (500 MV). Do not touch R208. Since R215 is only 15 ohms, you may have to increase or decrease R214 or R213. If R215 is at its maximum, 15 ohms, increase R214 by 15 ohms or decrease R213 by 15 ohms. Either one, or both, R213 or R214, must be a short.

i. Apply a 500 MVPP signal to input connector pin 1 and put the unit in the 500 MV FBW input position. There should be an undistorted output at TP B and C. If all indications are correct, reduce the input and switch to more and more sensitive input scales. Make sure that your signal generator does not put out any DC. Any DC from the generator will saturate the GOM-5C-01 at low level inputs. If no DC is produced by the generator and the unit still saturates, short inputs 1 and 2. If GOM-5C-01 saturation continues, repeat step h. After balancing and GOM-5 saturation persists, check for a shorted wire on the Gain switch. If the unit operates correctly, reconnect the common mode drive point. If it does not operate correctly, check Q203, Q204, Q205, and Q202. Replace them if necessary and then repeat step h. After completing step h, check for common mode rejection. The front end of the GOM-5C-01 should now be working properly.

5-16. DRIFTING THE FRONT END AND VCO OF THE GOM-5C-01.

5-17. Drifting should be performed under precisely controlled temperature conditions. A 50 kHz ±16% GOM-5/F Tuning Unit (either Square Wave or Sine Wave type) is used for drifting. Insert the GOM-5C-01 into GMA Housing within the temperature chamber. Turn the power on and let the unit run at room temperature for 15 minutes. Set up the equipment as shown in Figure 5-6 and proceed as follows:

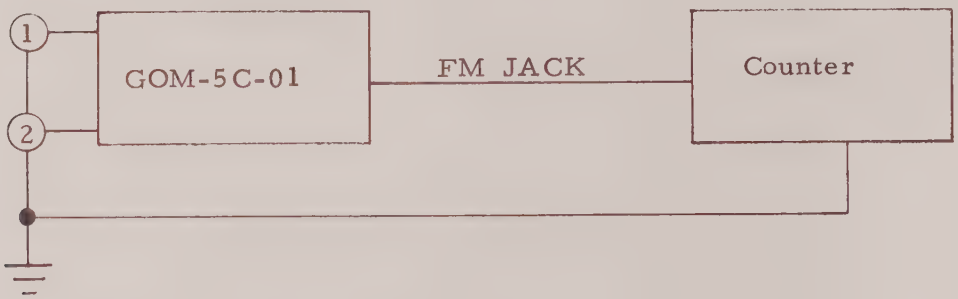


Figure 5-6

a. Adjust Gain Control to maximum (CW). Balance the Pre-Amplifier as described in the Alignment Procedure (paragraphs 5-10 and 5-11).

b. Switch Input FBW Switch to 500 MV position. Adjust the Gain Control to center frequency (CF) and note frequency. Switch Input FBW Switch to 5 MV position and note new CF.

c. Turn on the temperature chamber and raise the temperature 25°C. Note the new CF in the 5 MV position. Switch to the 500 MV position, and note this new CF.

5-18. VCO TEMPERATURE COMPENSATION. Using the 500 MV position center frequency readings noted in steps b and c of paragraph 5-17, calculate the Maximum Allowable Error and compensate the VCO if necessary.

a. CF at room temperature - CF at room temperature +25°C = $\Delta CF'$

b. $\frac{\Delta CF'}{25°C} = \frac{\Delta CF}{1°C} = <$ ±3.4 Hz Maximum Allowable Error

c. To compensate the VCO, adjust R130 and R130A. The parallel combination should be nominally 10 K. If the center frequency is too high, decrease the Texas Instrument CG 1/4 W resistor (R130A) and increase the Ward Leonard RN60C (R130). If the center frequency is to low, increase the Texas Instrument CG 1/4 W resistor (R130A) and decrease the Ward Leonard RN60C (R130). Repeat the above until the VCO meets the drift specifications.

5-19. FRONT END TEMPERATURE COMPENSATION. Using the 5 MV position center frequency readings noted in steps b and c of paragraph 5-17, calculate the Maximum Allowable Error and compensate the Front End if necessary.

a. CF at room temperature - CF at room temperature +25°C = $\Delta CF'$

b. $\frac{\Delta CF'}{25°C} = \frac{\Delta CF}{1°C} = <$ ±13 Hz Maximum Allowable Error

c. To compensate the Front End, adjust Pot R208. If the center frequency is too low, turn the Pot CCW. One turn is approximately equal to 40 Hz per °C. Rebalance the Pre-Amplifier as described in the Alignment Procedure (paragraphs 5-10 and 5-11). Redrift the unit until it meets the Front End specifications. The drift procedure may have to be repeated several times before the unit meets specifications.

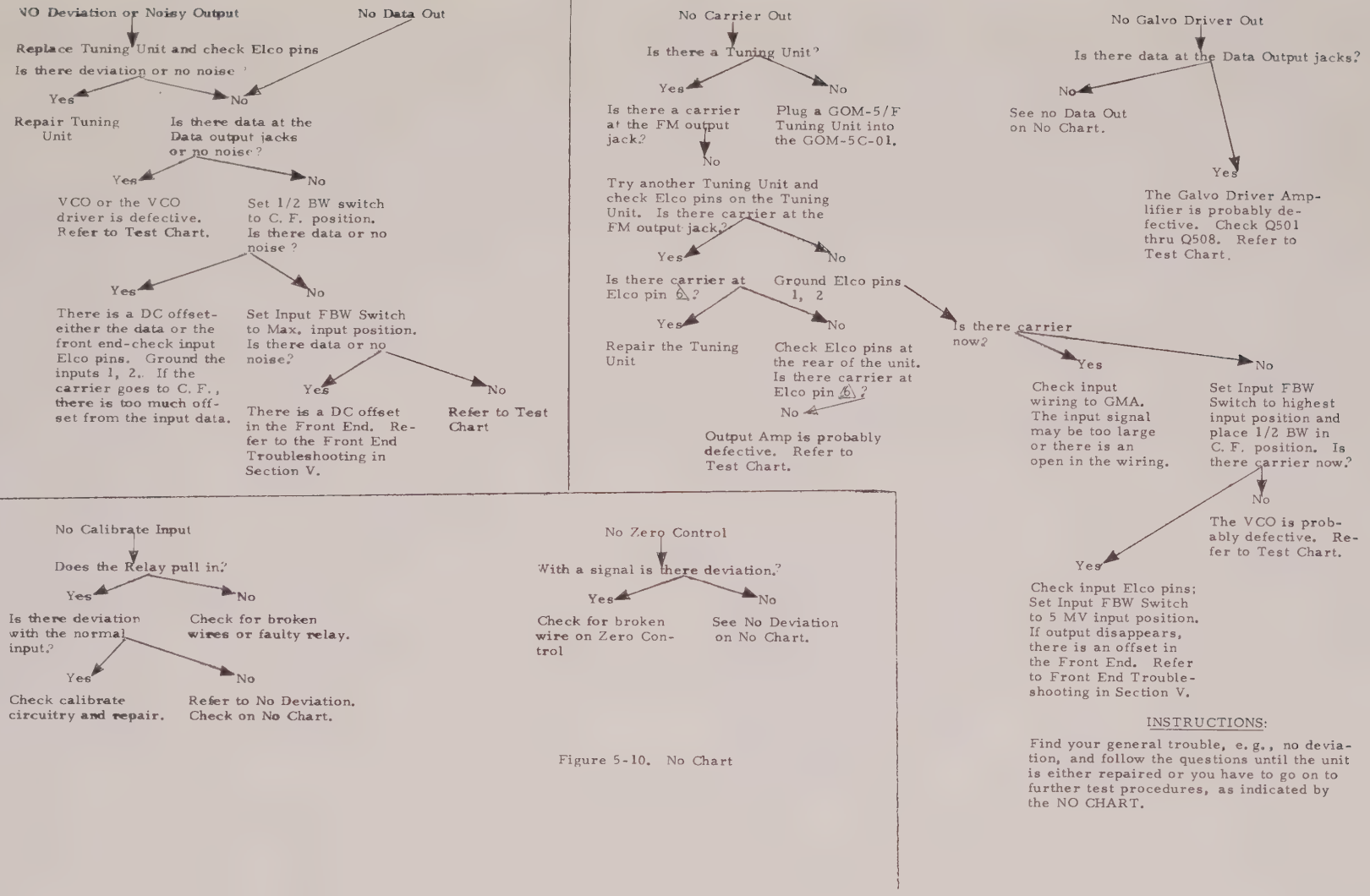
NOTE

The above procedure is very difficult and should be performed at the factory if possible.

Table 5-3. Recommended Spare Parts List, GOM-5C-01

Item No.	Part No.	Description	Qty. per 20 Units
1	28KM3	Switch, Daven	1
2	1SX1-T MS24547	Switch, Micro-Switch	1
3	8836-021-7Ns	Switch, Grayhill	1
4	E-A4AD	Relay, Leach or Phillips Equivalent	1
5	162-0121	10K Potentiometer, Spectrol	1
6	162-0120	2K Potentiometer, Spectrol	1
7	33005-1-102	1K Potentiometer, Bourns	1
8	2N4250	Transistor, Fairchild, Q202 thru Q204, Q101 thru Q103, Q105 thru Q107, Q120 thru Q125, Q127, Q503, Q504, Q506	12
9	2N3638	Transistor, Fairchild, Q201, CR206 thru CR211	4
10	2N3856A	Transistor, G. E., Q205, Q104, Q108, Q110 thru Q119, Q128 thru Q134, Q126, Q505	12
11	2N3563	Transistor, Fairchild, Q217, Q218	4
12	2N3391	Transistor, G. E., Q205, Q215, Q216, Q109	4
13	TN53	Transistor, Sprague, Q507, Q508	4
14	AS-821002	Transistor, Fairchild, Q128, Q129, Q213, Q214, DCS matched pair 2N4250	4 pairs
15	AS-821014	Transistor, Amelco, Q501, Q502, DCS matched pair 2N4302	2 pairs
16	DA11	Diode, Cont. Dev., CR204, CR202, CR108, CR109	4
17	1N3067	Diode, Cont. Dev., CR204, CR205, CR106, CR107	4
18	A414A	Diode, Solitron, CR101 thru CR105	4

NO CHART

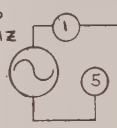
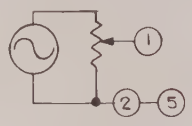
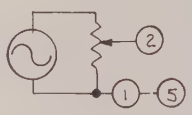
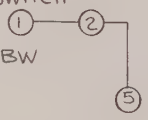

NO Deviation or Noisy Output
No Data Out
Replace Tuning Unit and check Elco pins
Is there deviation or no noise ?
Yes
No
Repair Tuning Unit
Is there data at the Data output jacks or no noise ?
Yes
No
VCO or the VCO driver is defective. Refer to Test Chart.
Set 1/2 BW switch to C. F. position. Is there data or no noise ?
Yes
No
There is a DC offset- either the data or the front end-check input Elco pins. Ground the inputs 1, 2. If the carrier goes to C. F., there is too much off-set from the input data.
Set Input FBW Switch to Max. input position. Is there data or no noise?
Yes
No
There is a DC offset in the Front End. Refer to the Front End Troubleshooting in Section V.
Refer to Test Chart
No Carrier Out
Is there a Tuning Unit?
Yes
No
Is there a carrier at the FM output jack?
Plug a GOM-5/F Tuning Unit into the GOM-5C-01.
No
Try another Tuning Unit and check Elco pins on the Tuning Unit. Is there carrier at the FM output jack?
Yes
No
Is there carrier at Elco pin 6?
Ground Elco pins 1, 2
Yes
No
Repair the Tuning Unit
Check Elco pins at the rear of the unit. Is there carrier at Elco pin 6?
No
Output Amp is probably defective. Refer to Test Chart.
Is there carrier now?
Yes
No
Check input wiring to GMA. The input signal may be too large or there is an open in the wiring.
Set Input FBW Switch to highest input position and place 1/2 BW in C. F. position. Is there carrier now?
No
The VCO is probably defective. Refer to Test Chart.
Yes
Check input Elco pins; Set Input FBW Switch to 5 MV input position. If output disappears, there is an offset in the Front End. Refer to Front End Trouble-shooting in Section V.
No Galvo Driver Out
Is there data at the Data Output jacks?
No
See no Data Out on No Chart.
Yes
The Galvo Driver Amp-lifier is probably de-fective. Check Q501 thru Q508. Refer to Test Chart.
No Calibrate Input
Does the Relay pull in?
Yes
No
Is there deviation with the normal input?
Check for broken wires or faulty relay.
Yes
No
Check calibrate circuitry and repair.
Refer to No Deviation. Check on No Chart.
No Zero Control
With a signal is there deviation?
Yes
No
Check for broken wire on Zero Con-trol
See No Deviation on No Chart.

INSTRUCTIONS:

Find your general trouble, e. g., no deviation, and follow the questions until the unit is either repaired or you have to go on to further test procedures, as indicated by the NO CHART.

Figure 5-10. No Chart

TEST CHART

INPUT CONDITIONS GAIN CONTROL CENTERED ZERO CONTROL CENTERED 1/2 BW SW IN CF	TEST POINT A (17)	TP B BASE Q128	TP C BASE Q129	TP D (2)	TP E (1)	TP F -DATA OUT	TP G +DATA OUT
	±1VDC	-1VDC ±1VDC	-1VDC ±1VDC	-24VDC ± 1 VDC	-24VDC ± 1 VDC	OVDC	OVDC
18V P-P AT 50HZ 	18V PP IN PHASE	18VPP IN PHASE	18V PP IN PHASE	-24VDC +1 VDC 0 VAC PP	-24VDC +1VDC 0 VAC PP	OVDC OVAC	OVDC OVAC
SET INPUT LEVEL TO CORRESPOND WITH WITH INPUT FBW SWITCH 	1/2INPUT LEVEL	2VPP DIFFERENTIAL		-24VDC ±1 VDC 4V AC PP FOR ±40% PLUG IN 2V AC PP FOR ±20% 1V AC PP FOR ±10%	-24VDC ± 1 VDC 4V AC PP FOR ± 40% PLUG IN 2V AC PP FOR ± 20% 1V AC PP FOR ± 10%	1V AC PP	1V AC PP
	1/2 INPUT LEVEL	2V PP DIFFERENTIAL				1V AC PP	1V AC PP
1/2 BW SWITCH  1N +1/2 BW	±1V DC	-1VDC ±1VDC	-1VDC ±1VDC			-1VDC	+1VDC
IN -1/2 BW	± 1 VDC	-1VDC ±1VDC	-1VDC ±1VDC			+1VDC	-1VDC
FAULTY INDICATION	DEFECTIVE FLOATING POWER SUPPLY OF FRONT END	DEFECTIVE FLOATING POWER SUPPLY OR FRONT END		DEFECTIVE LIMITER/ VCO DRIVER, DATA AMP OR VCO SEE NOTE 1 & 2		DEFECTIVE DATA AMP OR LIMITER/VCO DRIVER SEE NOTE 1	

NOTES:

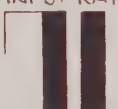
1) DISCONNECT DATA AMP JUMPERS a AND b RE-TRY TEST. IF THE UNIT TEST OK, NOW THE TROUBLE IS IN THE DATA AMP.

2) LIFT JUMPER c TO VCO. IF TP D AND E TEST OK. NOW THE TROUBLE IS IN THE VCO. IF NOT, THE TROUBLE IS IN THE VCO DRIVER OR LIMITER (DO NOT GROUND TPD OR E)

3) APPLY -24 VOLTS TO THE VCO SIDE OF JUMPER c, WITH THE JUMPER REMOVED. (DO NOT GROUND THIS POINT. APPLY ONLY -24 VDC OR AN OPEN CIRCUIT, GROUNDING WILL PROBABLY BLOW Q114, Q115, Q116, Q117.) VCO SHOULD RUN APPROXIMATELY AT CENTER FREQUENCY. THE FREQUENCY WILL VARY WITH THE -24 VOLTS.

4) TRY ANOTHER PLUG-IN

TEST CHART

TP H (5) / TP J (4)	TP K (19)	TP L (6)	TP M (15)
+2.8 -6.7 -16.2 NO FM	2.4 VPP NO FM CENTER FREQUENCY OUT	500 MV PP CENTER FREQUENCY NO FM	0 VDC
+2.8 -6.7 -16.2 NO FM	2.4 VPP NO FM CENTER FREQUENCY OUT	500 MV PP CENTER FREQUENCY NO FM.	0 VDC 0 VAC
+2.8 -6.7 -16.2 FM AT INPUT RATE	FM ABOUT CENTER FREQUENCY AT INPUT RATE.	FM AT INPUT RATE	10 VAC PP
+2.8 -6.7 -16.2 FM AT INPUT RATE	 FM ABOUT CENTER FREQUENCY AT INPUT RATE	FM AT INPUT RATE	10 VAC PP
+2.8 -6.7 -16.2	2.4 VPP AT HIGH BAND EDGE	HIGH BAND EDGE OUTPUT	+5 VDC
+2.8 -6.7 -16.2	2.4 VPP AT LOW BAND EDGE	LOW BAND EDGE OUTPUT	-5 VDC
DEFETIVE VCO OR VCO DRIVER SEE NOTES 2 & 3	DEFECTIVE GOM-5/F OR Q108 OR Q109 SEE NOTE 4.	DEFECTIVE GOM-5/F OR Q101, Q102 OR Q104	DEFECTIVE GALVO DRIVER AMPLIFIER NOTE; DOES NOT APPLY TO GOM-5C-02 OR GOM-5-03

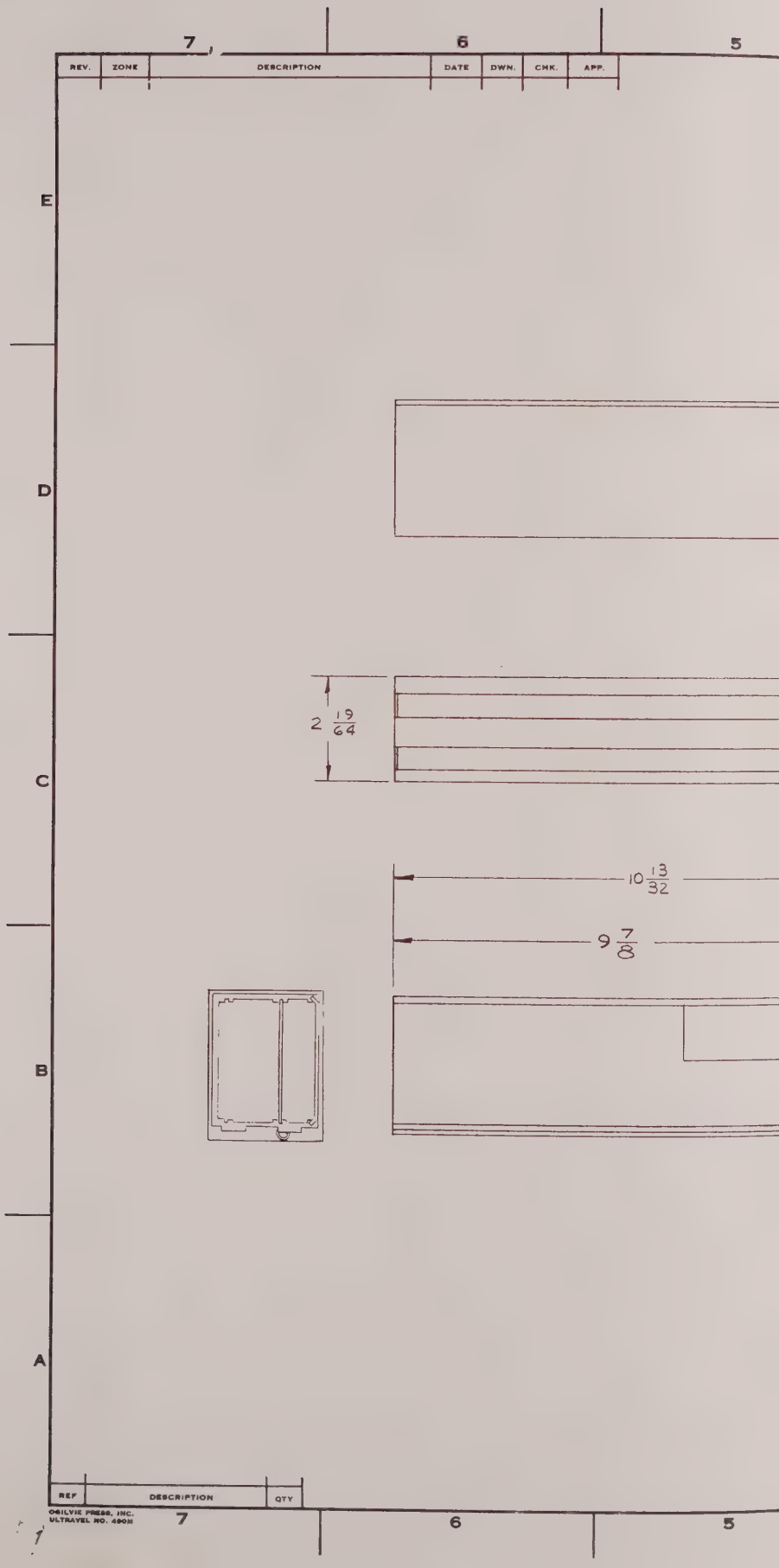
INSTRUCTIONS: THE INPUT CONDITIONS ARE STATED ON THE LEFT AND FOLLOW RIGHT ACROSS THE PAGE FOR THE CORRECT TEST RESULTS.
WHEN YOU GET A FAULTY INDICATION, LOOK AT THE BOTTOM OF THE CHART TO FIND THE PROBABLE SOURCE OF THE TROUBLE.

SECTION VI

DRAWINGS

6-1. GENERAL. The drawings listed in this section are furnished to supplement the information given in the text.

018676	Outline Drawing, GOM-5C-01
018680	Outline Drawing, GOM-5C-02
018685	Outline Drawing, GOM-5-03
018675	Schematic, GOM-5C-01
018679	Schematic, GOM-5C-02
018684	Schematic, GOM-5-03
018673	Final Assembly, GOM-5C-01
018678	Final Assembly, GOM-5C-02
018682	Final Assembly, GOM-5-03
018674	Front Panel Assembly, GOM-5C-01, GOM-5C-02
018668	Front Panel Assembly, GOM-5-03
018615	Board Assembly, Master, GOM-5C-01, GOM-5C-02
018614	Board Assembly, Master, GOM-5-03
015452	Board Assembly, Pre-Amp., GOM-5C-01, GOM-5C-02
015521	Board Assembly, Pre-Amp., GOM-5-03
015863	Board Assembly, Galvo Driver, GOM-5C-01
014182	Switch Lever Assembly, GOM-5C-01, GOM-5C-02, GOM-5-03
014582	Outline Drawing, GOM-5/F
014576	Final Assembly, Timing, GOM-5/F

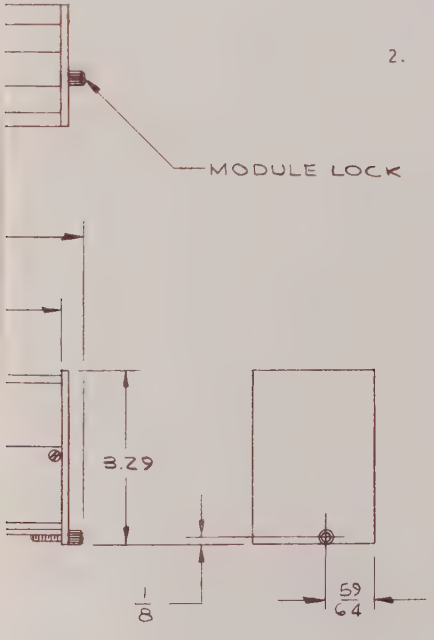

7
6
5
REV.
ZONE
DESCRIPTION
DATE
DWN.
CHK.
APP.
E
D
C
B
A
2 19/64
10 13/32
9 7/8
REF
DESCRIPTION
QTY
OGILVIE PRESS, INC.
ULTRAVEL NO. 490N
7
6
5

TABULATION PIN CONNECTION (LOWER)	
PIN NO.	DESCRIPTION
1	N.C.
2	N.C.
3	+35
4	+12
5	GROUND
6	SUM OUT 1
7	-12
8	-35
9	+18
10	-18
11	RELAY RETURN
12	N.C.
13	N.C.
14	N.C.
15	SPIN ZERO
16	SPIN GAIN
17	SPIN CAL.
18	MPX CAL. OUT
19	HIGH LEVEL OUT
20	SUM OUT 2 (GND)

TABULATION PIN CONNECTION (UPPER)	
PIN NO.	DESCRIPTION
1	INPUT A } NORMAL
2	INPUT B }
3	+35
4	+12
5	GROUND
6	N.C.
7	-12
8	-35
9	N.C.
10	N.C.
11	N.C.
12	+1/2 BANDWIDTH
13	-1/2 BANDWIDTH
14	CENTER FREQUENCY
15	+ DATA OUT, GALVO DRIVER (100 MA.).
16	- DATA OUT
17	CM GUARD
18	AUTO-CAL INPUT
19	N.C.
20	N.C.

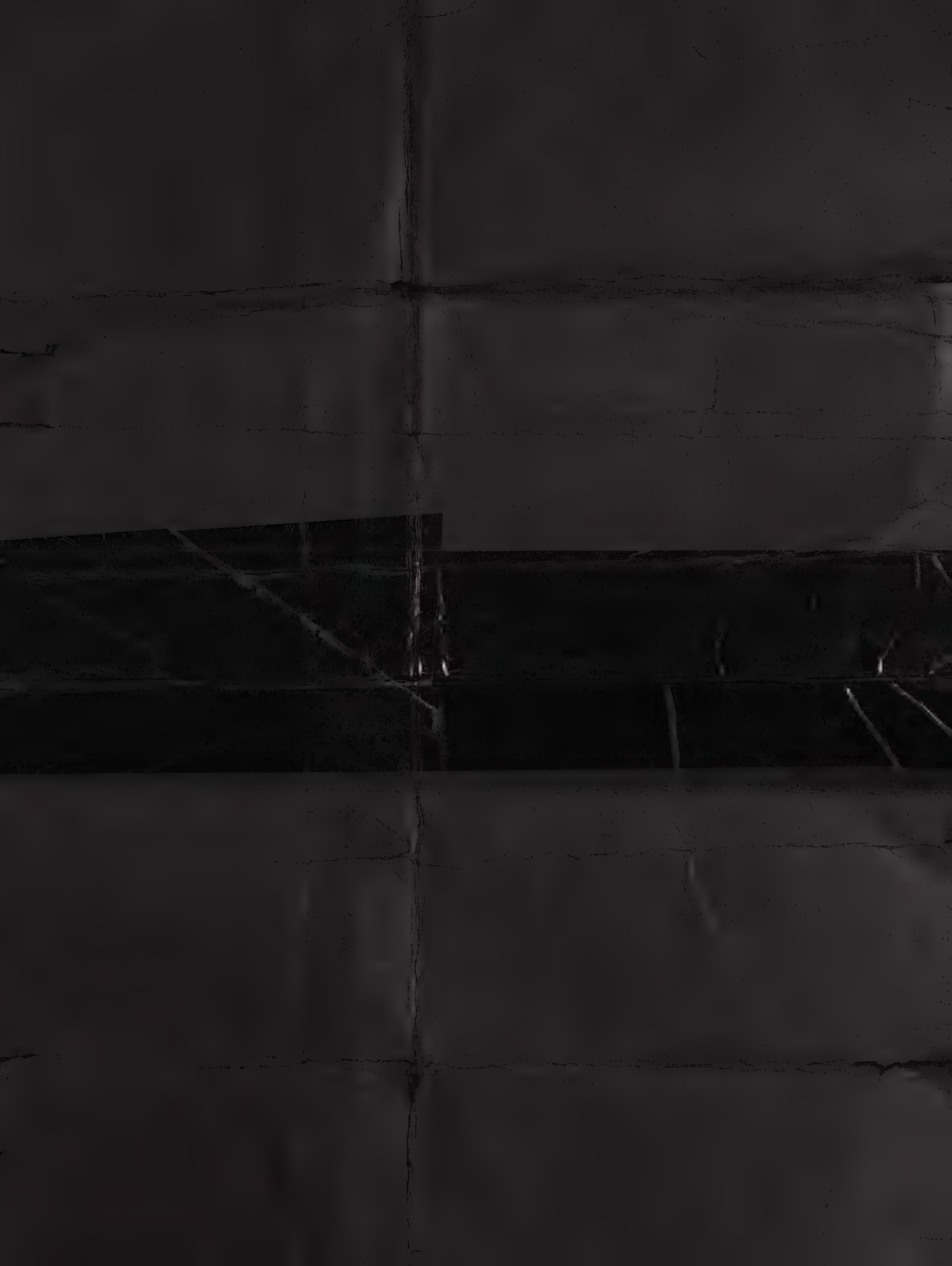
NOTES:

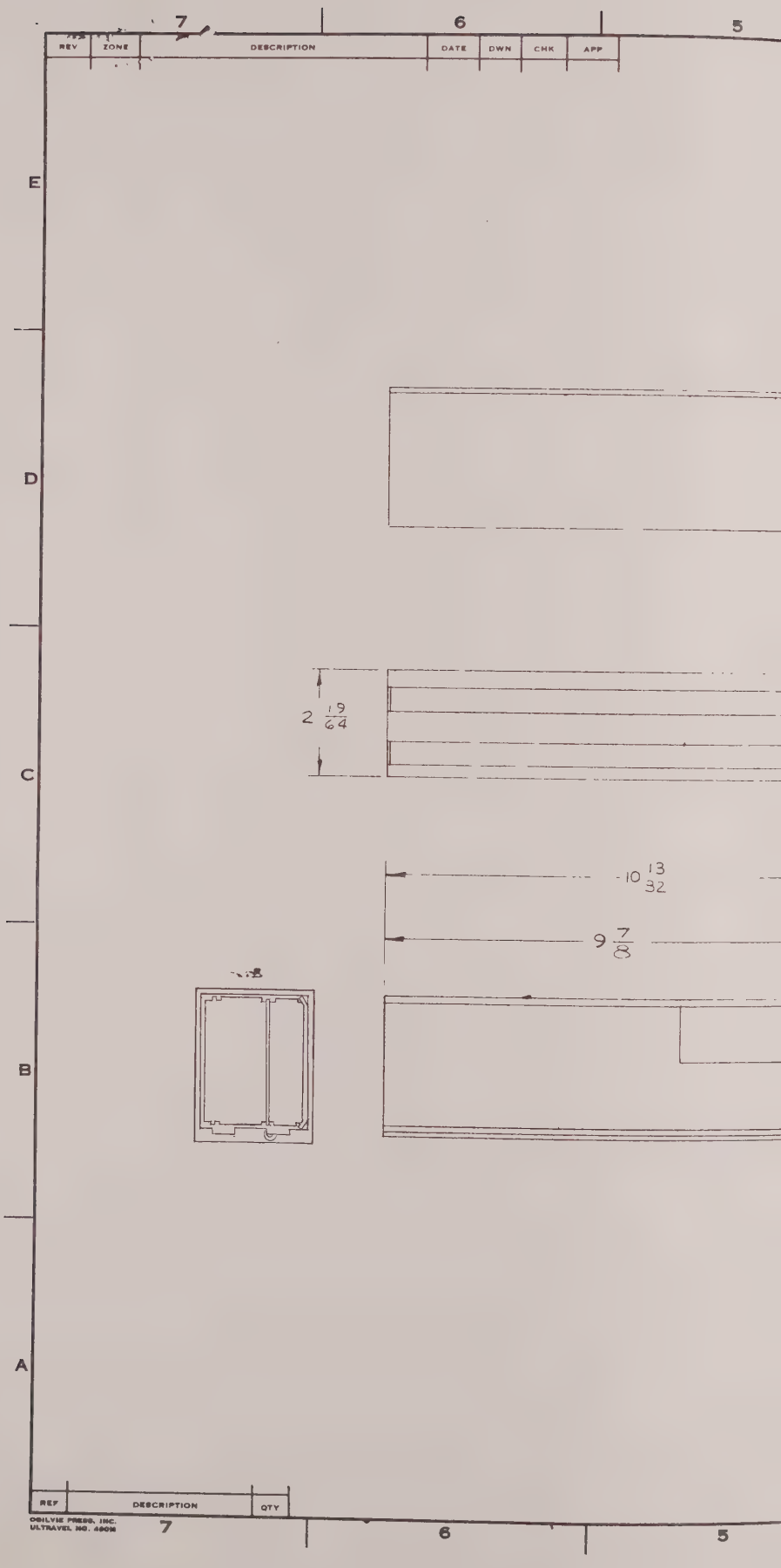
1. THE GOM-5C-01 PLUGS INTO THE DCS MODEL GMA 3 MODULE ASSEMBLY. ALL POWER AND SIGNAL CONNECTIONS ARE MADE FROM GMA 3 TO GOM-5C-01 VIA ELCO VARICON CONNECTORS AS TABULATED.
2. PIN CONNECTIONS ARE NUMBERED FROM TOP TO BOTTOM.



DATA CONTROL SYSTEMS, INC.			TITLE: OUTLINE DWG.		
TOLERANCES: UNLESS OTHERWISE SPECIFIED	DWN. G.R.	DATE 3/3/69	DO NOT SCALE DRAWING		
DECIMAL - 3 PLACE ± .005 DECIMAL - 2 PLACE ± .010 FRAC. ± 1/64 ANG. ± 0°30' FLATNESS WITHIN ~ /IN. FRACTIONAL HOLES -0. ± 1/64 NOTE: BREAK ALL SHARP CORNERS .005"-.015" SURFACE ROUGHNESS NOT TO EXCEED ✓	CHKD.	4/1/69	MAT'L		
	ENG.		FINISH		
	APP.	4/9/69	CO-018676	REV. A	
	SCALE		SHEET		

GOM-5C-01			
PRODUCT	NEXT ASSEMBLY	QTY / ASSY	



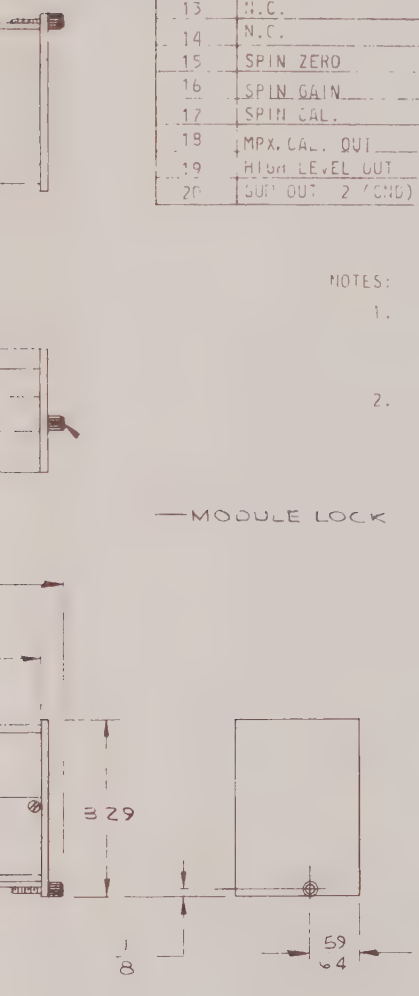

7
6
5
REV
ZONE
DESCRIPTION
DATE
DWN
CHK
APP
E
D
C
B
A
2 19/64
10 13/32
9 7/8
REF
DESCRIPTION
QTY
ODILVIE PRESS, INC.
ULTRAVEL IND. 48008
7
6
5

TABULATION PIN CONNECTION (LOWER)	
PIN NO.	DESCRIPTION
1	N.C.
2	N.C.
3	+35
4	+12
5	GROUND
6	SUM OUT 1
7	-12
8	-35
9	+18
10	-18
11	RELAY RETURN
12	N.C.
13	N.C.
14	N.C.
15	SPIN ZERO
16	SPIN GAIN
17	SPIN CAL.
18	MPX. CAL. OUT
19	HIGH LEVEL OUT
20	SUM OUT 2 (CMD)

TABULATION PIN CONNECTION (UPPER)	
PIN NO.	DESCRIPTION
1	INPUT A } NORMAL
2	INPUT B }
3	+35
4	+12
5	GROUND
6	N.C.
7	-12
8	-35
9	N.C.
10	N.C.
11	N.C.
12	+1/2 BANDWIDTH
13	-1/2 BANDWIDTH
14	CENTER FREQUENCY
15	+ DATA OUT
16	- DATA OUT
17	CM GUARD
18	AUTO-CAL INPUT
19	N.C.
20	N.C.

NOTES:

1. THE GOM-5C-02 PLUGS INTO THE DCS MODEL GMA 3 MODULE ASSEMBLY. ALL POWER AND SIGNAL CONNECTIONS ARE MADE FROM GMA 3 TO GOM-5C-02 VIA ELCO VARICON CONNECTORS AS TABULATED.
2. PIN CONNECTIONS ARE NUMBERED FROM TOP TO BOTTOM.



DATA CONTROL SYSTEMS, INC.	TITLE: OUTLINE DWG.	
TOLERANCES: UNLESS OTHERWISE SPECIFIED DECIMAL - 3 PLACE ± .005 DECIMAL - 2 PLACE ± .010 FRAC. ± 1/64 ANG. ± 0°30' FLATNESS WITHIN ⌒ /IN. FRACTIONAL HOLES .0 ± 1/64 NOTE: BREAK ALL SHARP CORNERS .005" - .015" SURFACE ROUGHNESS NOT TO EXCEED ✓	DWN G.R. DATE 3/28/69 CHKD [illegible] 4/9/69 ENG [illegible] 4/9/69 APP [illegible] 4/9/69 SCALE	DO NOT SCALE DRAWING MAT'L FINISH CO-018680 REV. A SHEET

PRODUCT	NEXT ASSEMBLY	QTY / ASSY
GOM-5C-02		

REV	ZONE	DESCRIPTION	DATE	DWN	CHK	APP

7 6 5

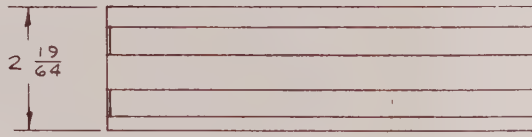
E

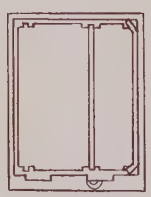
D

C

B

A





REF	DESCRIPTION	QTY

OBILVIE PRESS, INC.
ULTRAVEL NO 480M

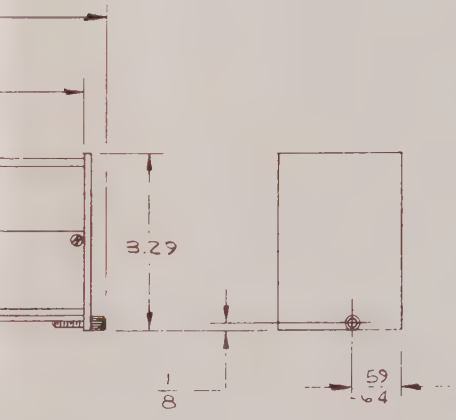
7 6 5

TABULATION PIN CONNECTION (LOWER)	
PIN NO.	DESCRIPTION
1	N.C.
2	N.C.
3	+35
4	+12
5	GROUND
6	SUM OUT 1
7	12
8	35
9	+18
10	-18
11	
12	N.C.
13	N.C.
14	N.C.
15	
16	
17	
18	
19	HIGH LEVEL OUT
20	SUM OUT 2 (GND)

TABULATION PIN CONNECTION (UPPER)	
PIN NO.	DESCRIPTION
1	INPUT A } NORMAL
2	INPUT B }
3	+35
4	+12
5	GROUND
6	N.C.
7	-12
8	-35
9	N.C.
10	N.C.
11	(FACTORY TEST POINT)
12	
13	
14	
15	+ DATA OUT
16	- DATA OUT
17	CM GUARD
18	
19	N.C.
20	N.C.

NOTES:

1. THE GOM-5-03 PLUGS INTO THE DCS MODEL GMA 3 MODULE ASSEMBLY. ALL POWER AND SIGNAL CONNECTIONS ARE MADE FROM GMA 3 TO GOM-5-03 VIA ELCO VARICON CONNECTORS AS TABULATED.
2. PIN CONNECTIONS ARE NUMBERED FROM TOP TO BOTTOM.



DATA CONTROL SYSTEMS, INC.		TITLE: OUTLINE DWG	
TOLERANCES: UNLESS OTHERWISE SPECIFIED DECIMAL - 3 PLACE ± .005 DECIMAL - 2 PLACE ± .010 FRAC ± 1/64 ANG ± 0°30' FLATNESS WITHIN — /IN FRACTIONAL HOLES .0 ± 1/64 NOTE: BREAK ALL SHARP CORNERS .005' .015' SURFACE ROUGHNESS NOT TO EXCEED	DWN G.R 4/9/69 CHKD. ENG. APP. NJ 4/9/69 SCALE	DO NOT SCALE DRAWING MAT'L FINISH CO-018685 REV. A SHEET	
GOM-5			
PRODUCT	NEXT ASSEMBLY	QTY / ASSY	

REV	DESCRIPTION	DATE	DWN	CHK	APP
B	CA-5053, CHGD RES. E5134 R514	4-29-69	GCD	MR	MR
C	CA-5090, CHGD TRANS Q405	6-2-69	GCD	MR	MR
D	CA-5087, CHGD POT. R215	6-16-69	GCD	MR	MR

COMMON MODE AMP.

PRE-AMPLIFIER

LIMITER/VCO DRIVER

DATA AMPLIFIER

+35V. (3)

+12V. (4)

+35V. (9)

INPUT B (1)

INPUT A (2)

CAL. SIG. IN (16)

-12V. (7)

-35V. (8)

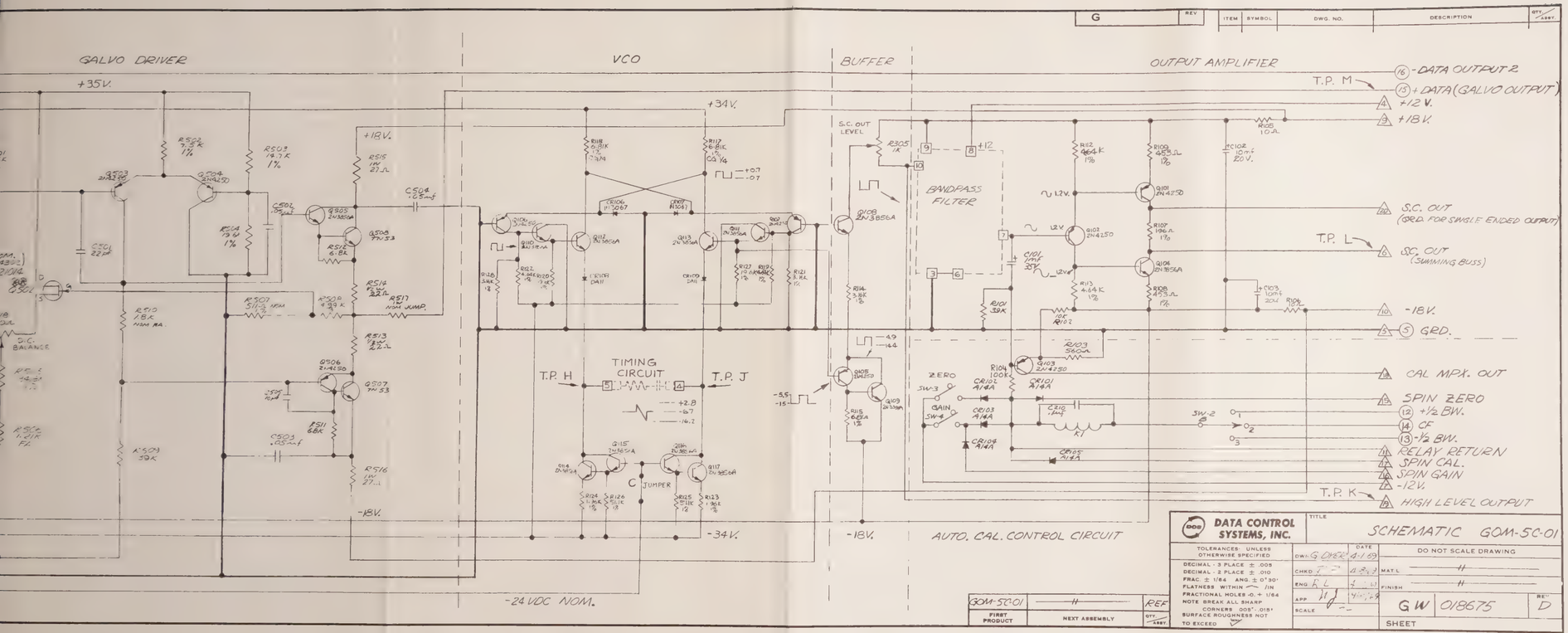
CM GUARD OUT (17)

-35V. (18)

T.P. A

NOTES:
1) * SELECT FOR ± 0.1% RESISTANCE TOL.
2) ** INDICATES MATCHED PAIR R216 & R217 RESISTORS WITHIN 0.1%
3) *** INDICATES MATCHED PAIR Q213 & Q214 TRANS. PER AS-821002 (NOM. 2N4250).
4) @ Q128 & Q129 ARE MATCHED PAIR TRANS. PER AS-821002 (NOM. 2N4250).
5) @@ Q501 & Q502 ARE MATCHED PAIR TRANS. PER AS-821014 (NOM. 2N4302).

REF	DESCRIPTION	QTY



REV.	ITEM	SYMBOL	DWG. NO.	DESCRIPTION	QTY./ASSY.
G					

DATA CONTROL SYSTEMS, INC.

TITLE: SCHEMATIC GOM-SC-01

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN .001 IN
FRACTIONAL HOLES Ø .+ 1/64
NOTE BREAK ALL SHARP CORNERS .005"-.018" SURFACE ROUGHNESS NOT TO EXCEED

	DATE
DWN G ORSE	4-1-69
CHKD	
ENG R L	
APP	
SCALE	

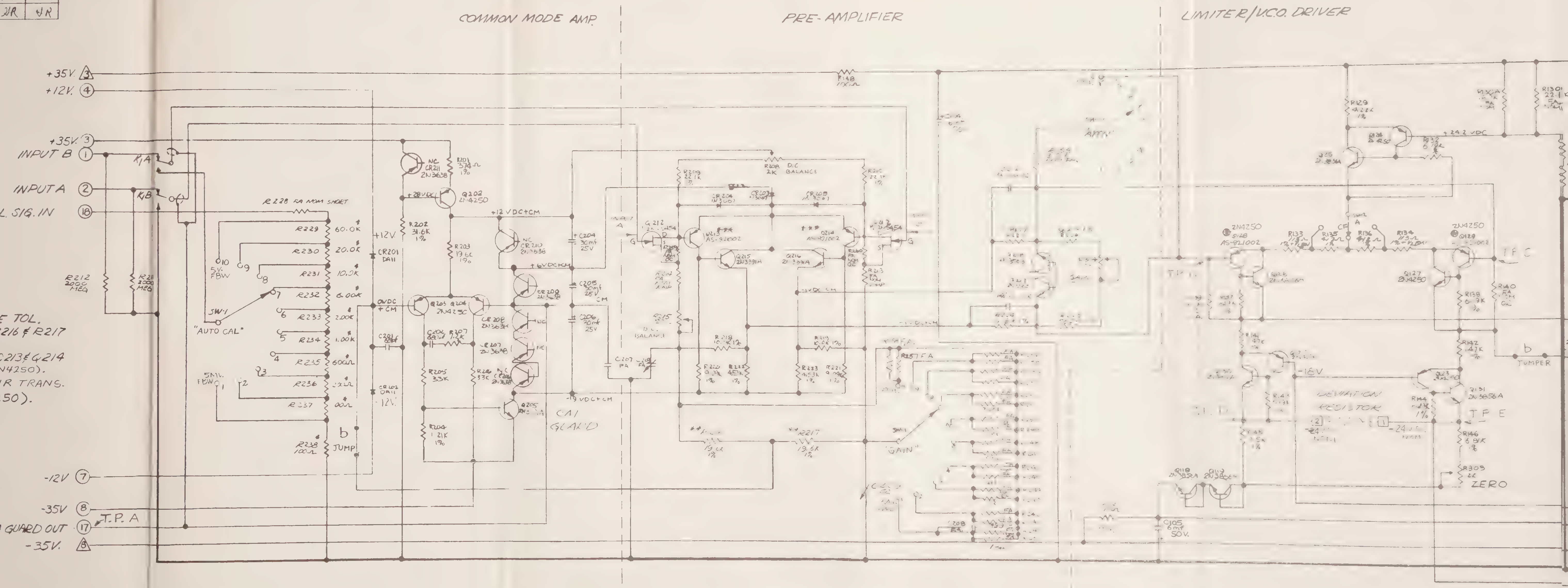
DO NOT SCALE DRAWING
MAT'L —
FINISH —

GW 018675 REV. D

SHEET

GOM-SC-01	—	REF
FIRST PRODUCT	NEXT ASSEMBLY	QTY./ASSY.

REV	DESCRIPTION	DATE	DWN	CHK	APP
B	CA-5090, CHG'D TRANS Q205	6-2-69	GCD	JR	JR
C	CA-5087, CHG'D POT R215	6-16-69	GCL	JR	JR

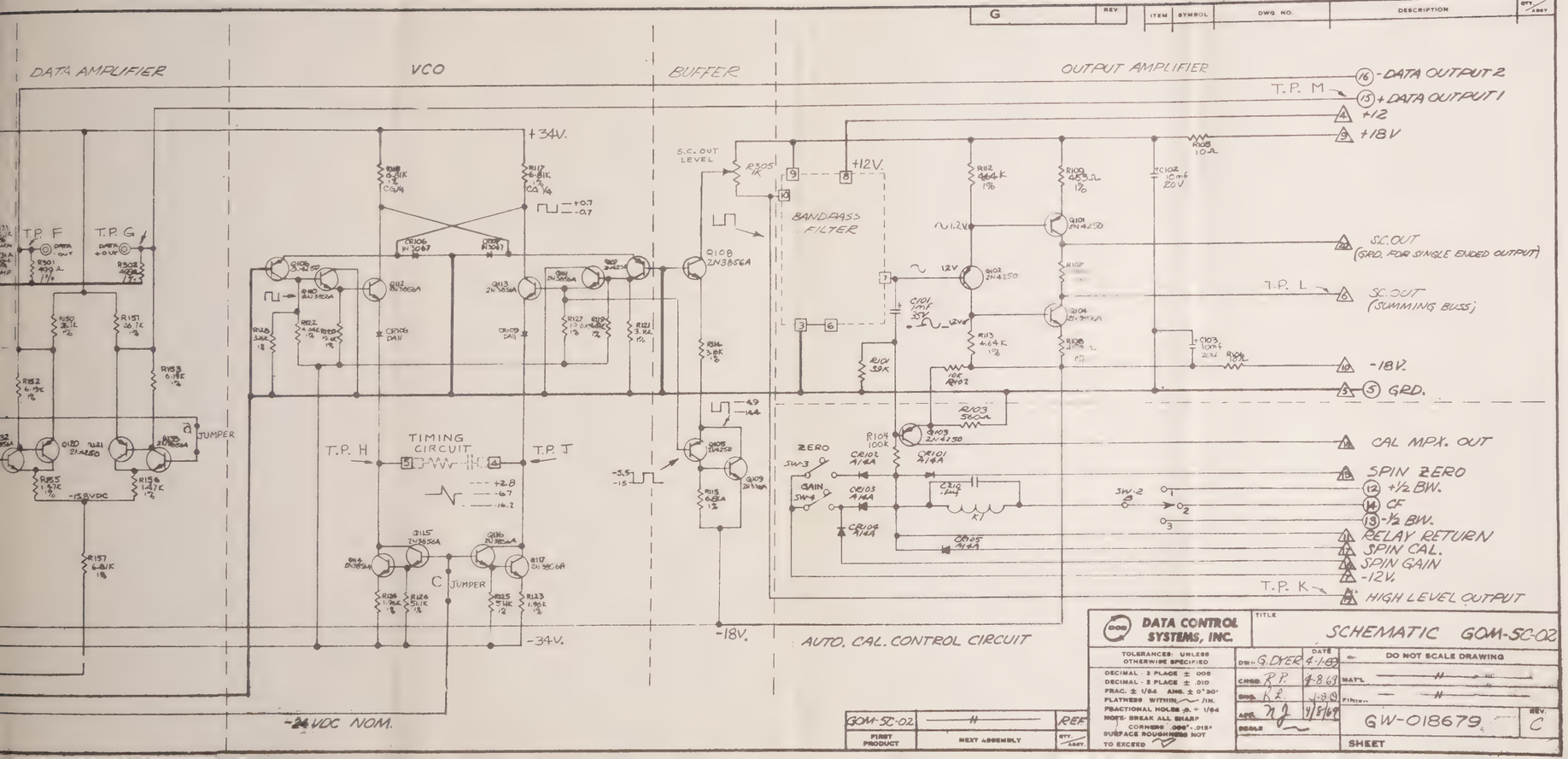


COMMON MODE AMP.
PRE-AMPLIFIER
LIMITER/V.C.O. DRIVER
+35V. 3
+12V. 4
+35V. 3
INPUT B 1
INPUT A 2
CAL. SIG. IN 18
-12V 7
-35V 8
CM GUARD OUT 17
-35V. 8
T.P. A
R212 2000 MEG
R211 2000 MEG
R228 FA NOM SHORT
R229 60.0K
R230 20.0K
R231 10.0K
R232 6.00K
R233 2.00K
R234 1.00K
R235 600Ω
R236
R237
R238 100Ω
5V. FBW
5MV. FBW
SW-1
"AUTO CAL"
b
JUMP
CR211 2N3638
R201 374Ω 1%
Q202 2N4250
+28VDC
R202 31.6K 1%
R203 19.6K 1%
+12V
CR201 DA11
CR202 DA11
-12V
0VDC +CM
+12 VDC+CM
+6VDC+CM
-19 VDC+CM
CR210 2N3638
CR209
Q203 Q204 2N4250
CR208 2N3638
CR207 2N3638
R205 33K
R206 33K
R204 1.21K 1%
R207 7.2K
Q205
C204 30mf 25V
C205 30mf 25V
C206 30mf 25V
C207 FA
CAL GUARD
R208 2K D.C BALANCE
R209 22.1K 1%
CR204 1N3601
CR205
Q212
Q213 AS-821002
Q214 AS-821002
Q215 2N3391A
Q216
R215 D.C. BALANCE
R218 10.0K 1%
R219 10.0K 1%
R220
R221
R222 453K 1%
R223 453K 1%
R216 19.6K 1%
R217 19.6K 1%
R148 100Ω
R257 FA
"GAIN"
C208 FA
C105 6mf 50V.
R129 1%
Q124
Q125
R132
+24.2 VDC
R130 1
R130 22.1K FA
2N4250 Q128 AS-821002
R133 113Ω 1%
R135
R136
R134 113Ω
2N4250 Q129
CF A
T.P. C
Q127 2N4250
R138 6.19K
R140 FA
R142 1.47K
b JUMPER
-16V
DEVIATION RESISTOR
2
1
-24
Q123
Q131 2N3856A
R144 1%
T.P. E
R146 6.81K
R303 2K ZERO
Q118
Q119

NOTES:

1) * SELECT FOR ± 0.1% RESISTANCE TOL.
2) ** INDICATES MATCHED PAIR R216 & R217 RESISTORS WITHIN 0.1%
3) *** INDICATES MATCHED PAIR Q213 & Q214 TRANS PER AS-821002 (NOM 2N4250).
4) ⊛ Q128 & Q129 ARE MATCHED PAIR TRANS. PER AS-821002 (NOM 2N.4250).

REF	DESCRIPTION	QTY



G	REV	ITEM	SYMBOL	DWG NO.	DESCRIPTION	QTY / ASSY

DATA CONTROL SYSTEMS, INC.

TITLE: SCHEMATIC GOM-SC-02

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .000
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN ~~ .IN.
FRACTIONAL HOLES ø.8 ± 1/64
MORE BREAK ALL SHARP
CORNERS .006"-.015"
SURFACE ROUGHNESS NOT TO EXCEED

DO NOT SCALE DRAWING

		DATE
DWN. G. DYER		4-1-69
CHKD. R.P.		4-8-69
ENGR. R.L.		4-8-69
APP.		4/8/69
DESIGN		

MAT'L —
FINISH —

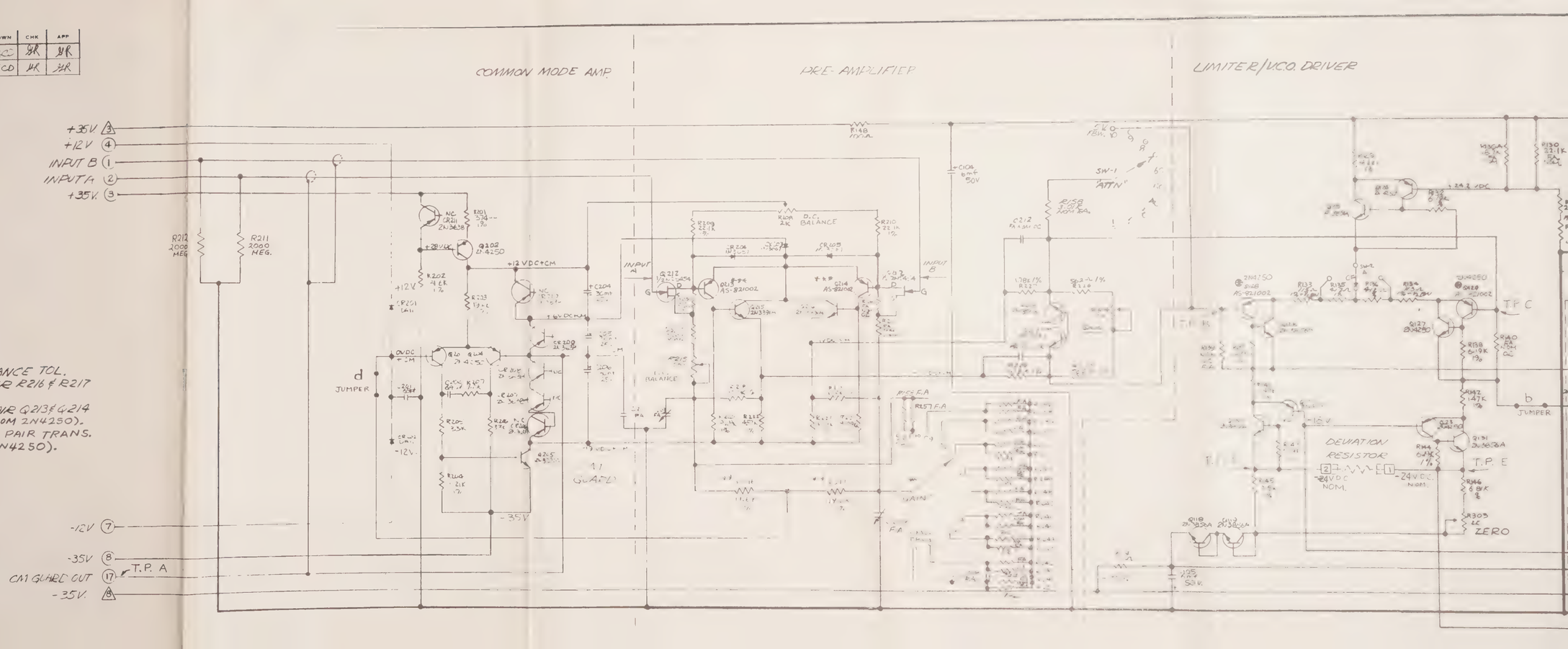
GW-018679 REV. C

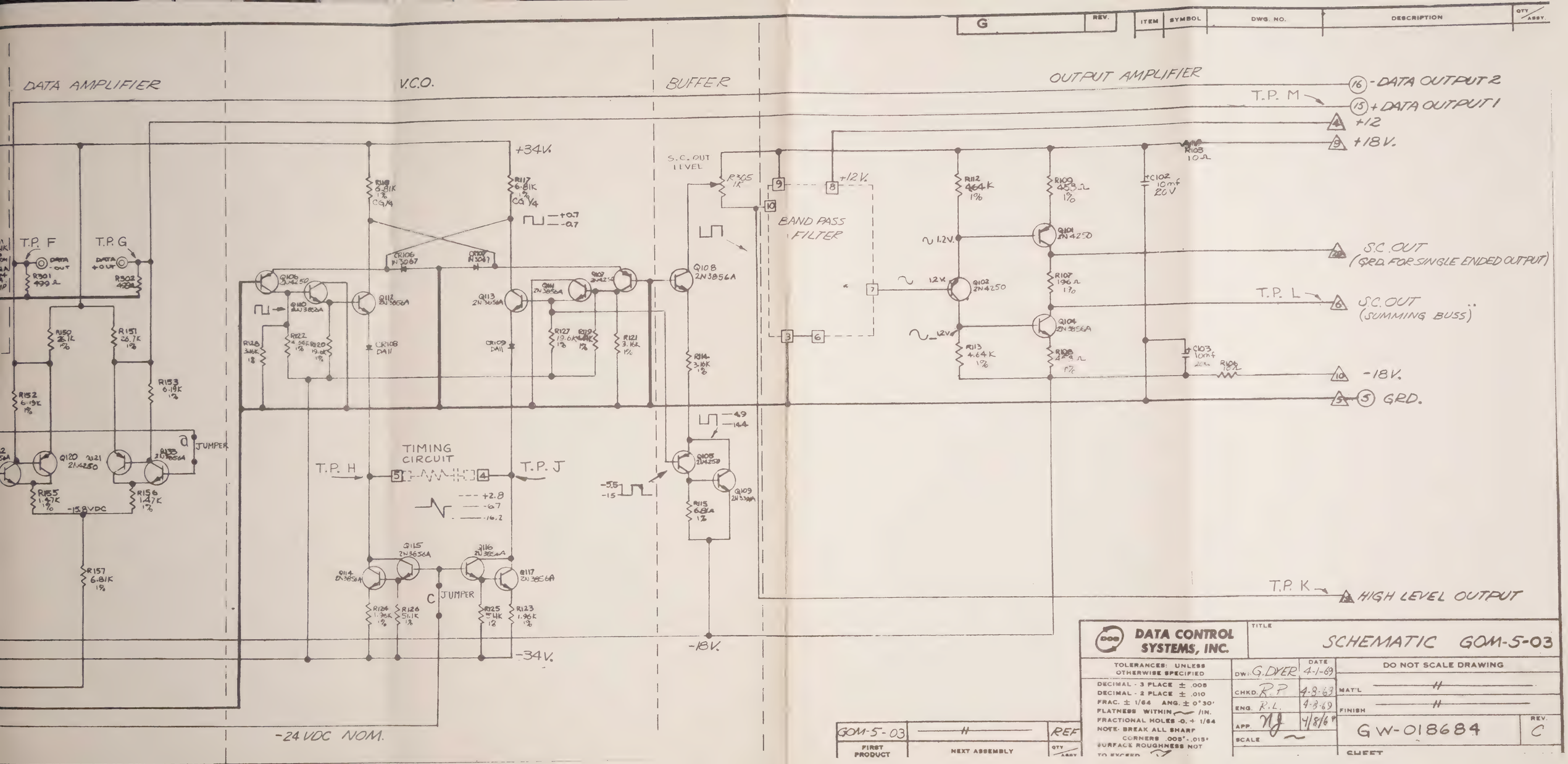
SHEET

GOM-SC-02 — REF
FIRST PRODUCT | NEXT ASSEMBLY | QTY. ASSY.

REV	DESCRIPTION	DATE	DWN	CHK	APP
B	CA-5090, CHGL TRANS Q205	6-2 69	GCD	JJR	JJR
C	CA-5087, CHGL POT R215	6-16 69	GCD	JJR	JJR

NOTES:
1) * SELECT FOR ± 0.1% RESISTANCE TOL.
2) ** INDICATES MATCHED PAIR R216 & R217 RESISTORS WITHIN 0.1%
3) *** INDICATES MATCHED PAIR Q213 & Q214 TRANS PER AS-821002. (NOM 2N4250).
4) @ Q128 & Q129 ARE MATCHED PAIR TRANS. PER. AS-821002 (NOM 2N4250).





REV.	ITEM	SYMBOL	DWG. NO.	DESCRIPTION	QTY/ASSY.
G					

DATA CONTROL SYSTEMS, INC.

TITLE: SCHEMATIC GOM-5-03

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN ~ /IN.
FRACTIONAL HOLES -0, + 1/64
NOTE- BREAK ALL SHARP CORNERS .005"-.015"
SURFACE ROUGHNESS NOT TO EXCEED ~

		DATE
DWN. G. DYER		4-1-69
CHKD. R.P.		4-8-69
ENG. R.L.		4-8-69
APP.		4/8/69
SCALE ~		

DO NOT SCALE DRAWING
MAT'L
FINISH
GW-018684
REV. C
SHEET

GOM-5-03		REF
FIRST PRODUCT	NEXT ASSEMBLY	QTY/ASSY

REV	ZONE	DESCRIPTION	DATE	DWN.	CHK.	APP.

ITEM	SYMBOL	DWG. NO.	DESCRIPTION	QTY / ASSY
1		CD-018610	CHASSIS	1
2		BD-015357	COVER	1
3		CA-018674	PANEL ASSY. FRONT	1
4		GA-018615	BD. ASSY. MASTER	1
5		BD-015464	INSULATOR CHASSIS	1
6			ADHESIVE ARMSTRONG #N-11	A/R
7		FA-015863	BOARD ASSY, GALVO DRIVER	1
8		TA-015456	BOARD ASSY. PRE AMP.	1
9		AS-826026-26	SCR #2-56, 100° FHMS	8
10		BF-016176	BRACKET	1
11		CF-015529	THERMAL EQUALIZER INS. FAB	1
12		AS-826028-26	SCR # 2-56, PHMS	4
13		AS-826026-40	SCR # 4-40, 100° FHMS	1

REF	DESCRIPTION	QTY

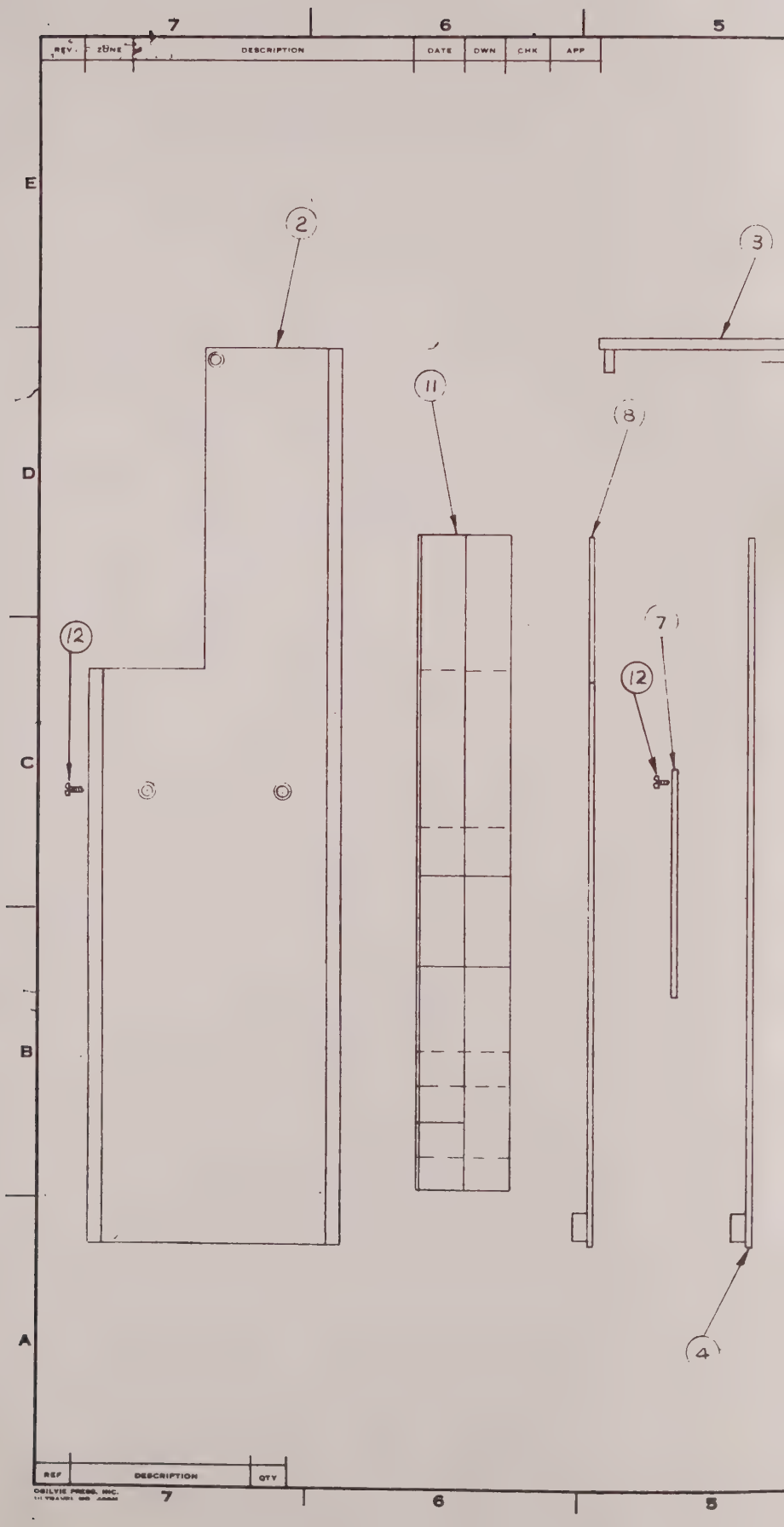
GOM-5C-01 | PRODUCT | NEXT ASSEMBLY | QTY / ASSY

OGILVIE PRESS, INC. ULTRAVEL NO. 490M

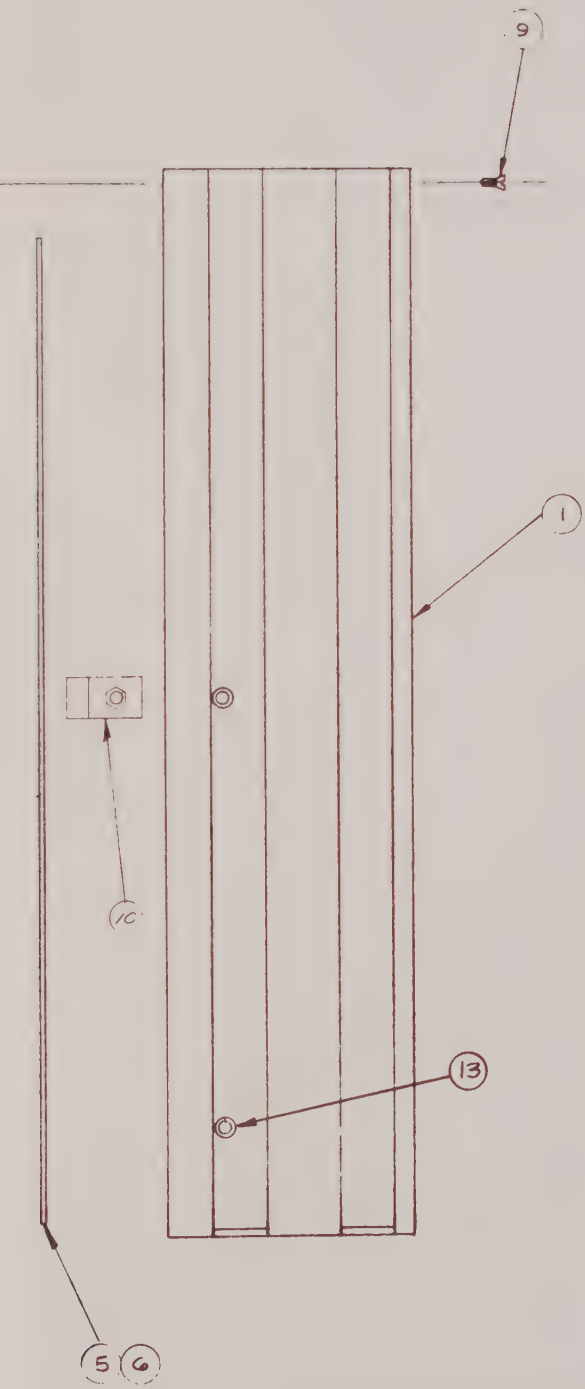
DATA CONTROL SYSTEMS, INC.

TITLE: FINAL ASSY, GOM-5C-01

TOLERANCES UNLESS OTHERWISE SPECIFIED		DATE	DO NOT SCALE DRAWING
DECIMAL - 3 PLACE ± .005	DWN. G N	3/14/19	
DECIMAL - 2 PLACE ± .010	CHKD. [illegible]	4/8/19	MAT'L
FRAC ± 1/64 ANG. ± 0° 30'	ENG. [illegible]	4/8/19	FINISH
FLATNESS WITHIN ⌒ /IN.	APP. [illegible]	4/8/19	
FRACTIONAL HOLES ±0.± 1/64	SCALE 1:1		CA-018673 REV. A
NOTE- BREAK ALL SHARP CORNERS .005"-.015"			SHEET
SURFACE ROUGHNESS NOT TO EXCEED √			


7
6
5
REV.
ZONE
DESCRIPTION
DATE
DWN
CHK
APP
E
D
C
B
A
2
3
11
8
12
7
12
4
REF
DESCRIPTION
QTY
7
6
5

ITEM	SYMBOL	DWG NO.	DESCRIPTION	QTY / ASSY
1		CD-018610	CHASSIS	1
2		BD-015357	COVER	1
3		CA-018683	PANEL ASSY FRONT	1
4		GA-018614	BD. ASSY. MASTER	1
5		BD-015464	INSULATOR CHASSIS (GIC-2)	1
6			ADHESIVE. ARMSTRONG #N-11	A/R
7		BD-015465	VCO COVER SHIELD	1
8		TA-015521	BOARD ASSY. PRE AMP.	1
9		AS-826026-*-26	SCR. #2-56, 100° FHMS	8
10		BF-016106	BRACKET	1
11		CF-015529	THERMAL EQUALIZER INS. FAB	1
12		AS-826028-26	SCR # 2-56, PHMS	4
-13		AS-826026-40	SCR # 4-40, FHMS	1



DATA CONTROL SYSTEMS, INC.

TITLE: FINAL ASSY, GOM-5-03

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0° 30'
FLATNESS WITHIN ~ IN.
FRACTIONAL HOLES Ø. ± 1/64
NOTE: BREAK ALL SHARP CORNERS .005"-.010"
SURFACE ROUGHNESS NOT TO EXCEED

		DATE
DWN.	G. R.	3/28/69
CHKD.		4/7/69
ENG.		4/7/69
APP.		4/7/69
SCALE	1:1	

DO NOT SCALE DRAWING
MAT'L
FINISH

CA-018682 REV. A

SHEET

GOM-5-03 FIRST PRODUCT | NEXT ASSEMBLY | QTY / ASSY

REVISIONS				
DESCRIPTION	DATE	BY	CHK'D	APP'D

SYMBOL	PART NO.	DESCRIPTION	QTY. REQ'D
	AS-826034-16-04	WASHER NYLON	1
		KNOB, VEMALINE 1016-2A	1
	BD-014962	BRACKET	1
W-2	BD-014981	SWITCH, DAVEN 28KM3 W/HD. WARE	1
		SPACER, PIC B8-4	4
	BD-014197	SPRING	2
W-3 W-4		SWITCH, 19XI-T, MS24547	2
W-1		SWITCH, GRAYHILL 8A-36-3-1-10N	1
304		POT SPECTROL 162-0121, 10K	1
303		POT SPECTROL 162-0120, 2K	1
	BF-014178	SWITCH COLLAR, FAB	2
	BA-014182	SWITCH LEVER, ASSY	1
	BF-014971	BRACKET SWITCH, FAB	1
		ROLL PIN, ESNA #RP-B79-012-062-187	1
	BD-008924	KNOB, CAPTIVATED	1
	BD-015477	SCREW, CAPTIVATED	1
		JACK, SEALECTRO, SKT-10-BLUE	1
		GREEN	1
305		POT, BOURNS 3300S-1-102 1KΩ	1
	BD-018666	PANEL, FRONT	1

REV. F

DATE
3/26/69
4/8/69
4/8/69
4/8/69

DATA-CONTROL SYSTEMS, INC.
DANBURY, CONN.

TITLE: PANEL ASSY, FRONT

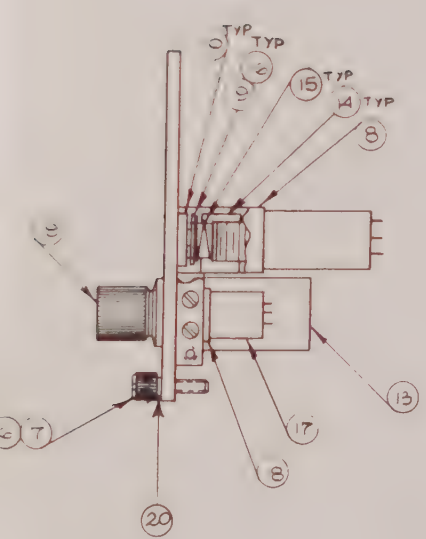
CODE IDENT. NO	SIZE			REV.
	C	CA	018674	A

SCALE ~ SHEET

REF

OBILVIE

REVISIONS					
SYM.	DESCRIPTION	DATE	BY	CHK'D	APP'D



ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY. REQ'D
20		AS-826039-16-04	WASHER NYLON	1
19			KNOB, VEMALINE 1016-2A	1
18		BD-014962	BRACKET	1
17	SW-2	BD-014981	SWITCH, DAVEN 28KM3 W/HD. WARE	1
16			SPACER, PIC B8-4	4
15		BD-014197	SPRING	2
14	SW-3 SW-4		SWITCH, ISXI-T, MS24547	2
13	SW-1		SWITCH, GRAYHILL 8A-36-3-1-10N	1
12	R304		POT SPECTROL 162-0121, 10K	1
11	R303		POT SPECTROL 162-0120, 2K	1
10		BF-014178	SWITCH COLLAR, FAB	2
9		BA-014182	SWITCH LEVER, ASSY	1
8		BF-014971	BRACKET SWITCH, FAB	1
7			ROLL PIN, ESNA #RP-B79-012-062-187	1
6		BD-008924	KNOB, CAPTIVATED	1
5		BD-015477	SCREW, CAPTIVATED	1
4			JACK, SEALECTRO, SKT-10-BLUE	1
3			GREEN	1
2	R305		POT, BOURNS 3300S-1-102 1KΩ	1
1		BD-018666	PANEL, FRONT	1

REV. F

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0° 30'
FLATNESS WITHIN ~ /IN.
FRACTIONAL HOLES -D, ± 1/64
NOTE- BREAK ALL SHARP CORNERS .005" - .015"
SURFACE ROUGHNESS NOT TO EXCEED ~

MAT'L ~

FINISH ~

		DATE
DWN.	G.R.	3/26/69
CHK'D.	[illegible]	4/8/69
PROJ. ENG.	[illegible]	4/8/69
APP'D.	[illegible]	4/8/69
APP'D.		

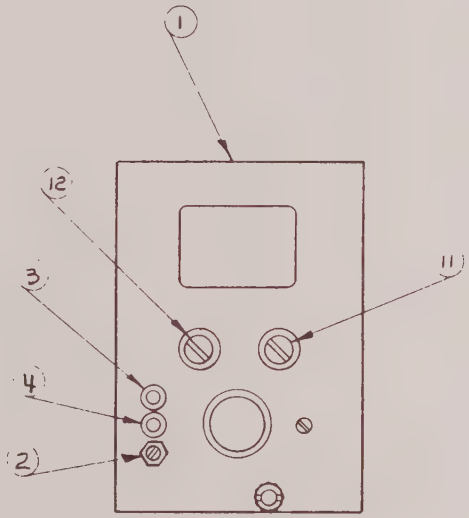
DATA-CONTROL SYSTEMS, INC.
DANBURY, CONN.

TITLE: PANEL ASSY, FRONT

CODE IDENT. NO	SIZE			REV.
	C	CA	018674	A

SCALE ~ SHEET

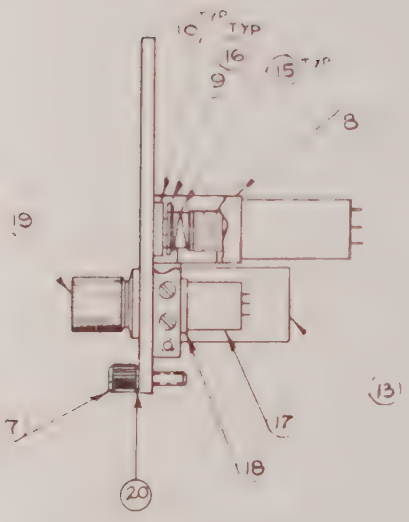
M-SC-01 CA-018673 1
FIRST PRODUCT | NEXT ASSEMBLY | QTY. ASS'Y



REF	DESCRIPTION	QTY.

OGILVIE PRESS. INC. BROOKLYN 17. N. Y. STOCK NO 430M

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK'D	APP'D



ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY REQ'D
20		AS-826034-16-04	WASHER NYLON	1
19			KNOB, VEMALINE 1016-2 A	1
18		BD-014962	BRACKET	1
17	SW-2	BD-014381	SWITCH, DAVEN 28KM3 W/HD. WARE	1
16			SPACER, PIC B8-4	4
15		BD-014197	SPRING	2
13	SW-1		SWITCH, GRAYHILL 8A-36-3-1-10N	1
12	R304		POT SPECTROL 162-0121, 10K	1
11	R303		POT SPECTROL 162-0120, 2K	1
10		BF-014178	SWITCH COLLAR, FAB	2
9		BA-014182	SWITCH LEVER, ASSY	1
8		BF-014971	BRACKET SWITCH, FAB	1
7			ROLL PIN, ESNA #RP-BT9-012-062-187	1
6		BD-008924	KNOB, CAPTIVATED	1
5		BD 015477	SCREW, CAPTIVATED	1
4			JACK, SEALECTRO, SKT-10-BLUE	1
3			GREEN	1
2	R-305		POT; BOURNS #3300S-1-102 1KΩ	1
1		CD-018668	PANEL, FRONT	1

TOLERANCES UNLESS OTHERWISE SPECIFIED			DATE
DECIMAL 3 PLACE ± .005	DWN	G.C.D.	3/28/69
DECIMAL 2 PLACE ± .010	CHK'D	N.H.J.	4/8/69
FRAC ± 1/64 ANG. ± 0° 30'	PROJ ENG	N.H.J.	4/8/69
FLATNESS WITHIN ~ /IN.	APP'D	N.H. Johns	4/3/69
FRACTIONAL HOLES-Ø. ± 1/64	APP'D		
NOTE- BREAK ALL SHARP CORNERS .005"-.015"			
SURFACE ROUGHNESS NOT TO EXCEED ~			
MAT'L ~			
FINISH ~			

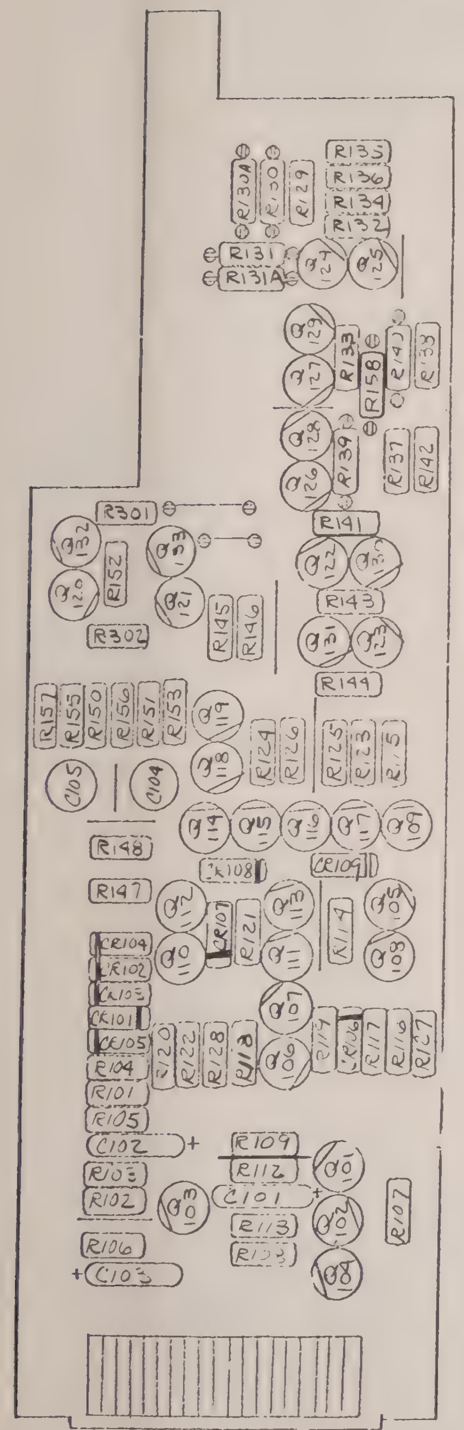
DCC **DATA-CONTROL SYSTEMS, INC.**
DANBURY, CONN.

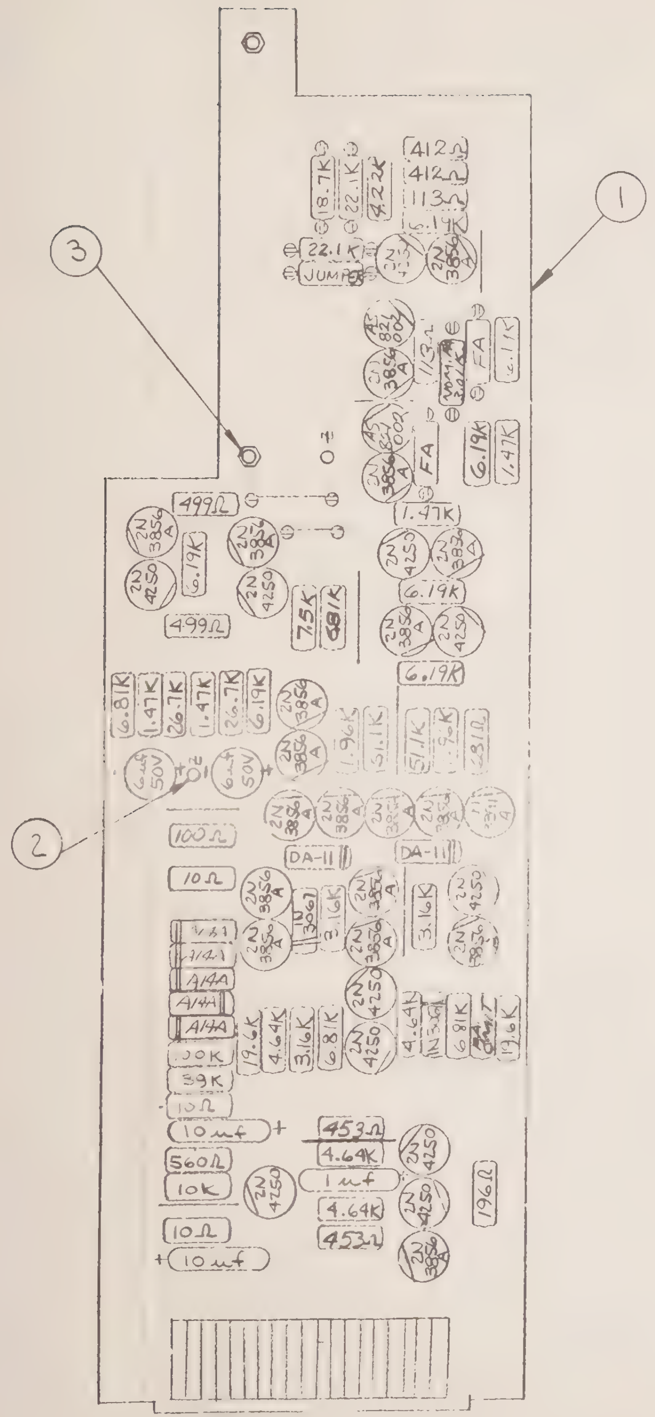
TITLE
PANEL ASSY, FRONT

CODE IDENT. NO.	SIZE		REV.
	C	CA 018683	A

SCALE ~ SHEET

-5-03	CA-018682	1
	NEXT ASSEMBLY	QTY ASS'Y





ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY REQ'D
	Q127		TRANSISTOR, G.E. [illegible]	[illegible]
*	Q128 Q129	AS-821002	[illegible], MATCHED PAIR	1
	Q130		[illegible]	1
	Q131		↓	1
	Q132		↓	1
	Q133		↓	1
2		Jumper	#22 Buss (Z) Type	A/R
3	AD	AD-010710	[illegible]	

ITEM	SYMBOL	PART NO.	DESCRIPTION		QTY REQ'D
	[illegible]		DIODE, G.E.	A14A	1
	[illegible]		↓	A14A	1
	[illegible]		↓	A14A	1
	[illegible]		↓	A14A	1
	[illegible]		Diode, Cont. Dev.	1N3067	1
	[illegible]		↓	1N3067	1
	[illegible]		Diode, Solitron	DA-11	1
	[illegible]		↓	DA-11	1
	[illegible]		Transistor, Motorola	2N4250	1
	[illegible]		↓	2N4250	1
	[illegible]		↓	[illegible]	1
	[illegible]		Transistor, G. E.	[illegible]	1
	[illegible]		Transistor, Motorola	[illegible]	1
	[illegible]		↓	[illegible]	1
	[illegible]		↓	[illegible]	1
	[illegible]		Transistor, G. E.	[illegible]	1
	[illegible]		↓	[illegible]	1
				[illegible]	
				[illegible]	
				[illegible]	
				[illegible]	
	[illegible]			[illegible]	
	[illegible]			2N3856A	
	Q117			2N3856A	
	Q118			[illegible]	
	Q119		↓	2N3856A	
	Q120		Transistor, Motorola	[illegible]	
	[illegible]			[illegible]	
	[illegible]			[illegible]	1
	[illegible]			[illegible]	1
	[illegible]		↓	2N4250	1
	Q125		Transistor, G. E.	2N3856A	1
	Q126		↓	2N3856A	1

ITEM	SYMBOL
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	R143
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	R150
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	R13[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]
	[illegible]

	Res WL, RN60C, 1/4W, 1%,	412Ω	1
	Res, Electra, MF5C-D 1/4W 1%	499Ω	1
		499Ω	1
	Res, Electra, MF5GD 1/4W, 1%	6.19K	1
		6.19K	1
		F/A	1
		F/A	1
		1.47K	1
		1.47K	1
		6.19K	1
		6.19K	1
	Res WL, RN60E, 1/4W, 1%	7.5K	1
	Res WL, RN60E 1/4W 1%	681K	1
	Res AB, CB, 1/4W, 10%	10Ω	1
	Res, AB, CB, 1/4W, 10%	100Ω	1
	Res, Electra, MF5GD, 1/4W, 1%	26.7K	1
		26.7K	1
		6.19K	1
	Res, Electra, MF5GD, 1/4W, 1%	6.19K	1
	Res WL, RN60E, 1/4W 1% F.A.	3.7K	1
	Res Electra MF5GD, 1/4W, 1%	1.47K	1
		1.47K	1
		6.81K	1
	Res WL RN60C 1/4W 1% F.A.N.M.	Jump	1
	ELECTRA MF5C, 1/4W, 1% NOM FA	3.01K	1
	Cap, Sprague 150D, 20%, 35V.	1uf	1
	20%,	10uf	1
	20V.	10uf	1
	Cap, Gentronics, 101D BS, 20%, 50V.	6uf	1
	Cap Gentronics 101D BS, 20%, 50V.	6uf	1
	Diode G. E.	A14A	1
PART NO.	DESCRIPTION		QTY. REQ'D

ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY. REQ'D
1		DF-018504	Board Fab Master	1
	R101		Res, AB, CB, 1/4W, 10% 39K	1
	R102		10K	1
	R103		500Ω	1
	R104		100K	1
	R105		10Ω	1
	R106		10Ω	1
	R107		Res, Electra, MF5C-D, 1/4W 1% 196Ω	1
	R108		453Ω	1
	R109		453Ω	1
	R112		4.64K	1
	R113		4.64K	1
	R114		3.16K	1
	R115		681Ω	1
	R116		F/A NM7	1
	R117		Res, T.I., C.G., 1/4W, 1% 3.01K	1
	R118		Res, T.I., C.G., 1/4W, 1% 3.01K	1
	R119		Res WL, RN60C, 1/4W, 1% 1.02K	1
	R120		12.6K	1
	R121		4.64K	1
	R122		4.64K	1
	R123		1.96K	1
	R124		1.96K	1
	R125		51.1K	1
	R126		51.1K	1
	R127		12.6K	1
	R128		2.15K	1
	R129		422K	1
	R130		Res, T.I., C.G., 1/4W, 1%, F.A. NOM FA 22.1K	1
	R131		Res WL, RN60E 1/4W 1% F.A. NOM 22.1K	1
	R132		Res WL, RN60C, 1/4W 1% 6.19K	1
	R133		113Ω	1
	R134		113Ω	1
	R135		412Ω	1

REV.	DESCRIPTION	DATE	BY	CHK	APP.
B	CA-4929, CHGD RES VALUES	2/17/69	GCD	YR	YR
C	CA-5007, DELETED R110 & R111	3-12-69	GCD	YR	YR
D	CA-4856-1, CHGD R101 THRU R106	3-17-69	GCD	YR	YR
E	CA-5027, CHGD RES VALUES	4-9-69	GCD	YR	YR

NOTES:

1. * Q128, Q129 ARE MATCHED PAIR 2N4250 PER AS-821002.
2. *** R117, R116 ARE T.I., C.G. ¼, ¼W, 1% RESISTORS TO OBTAIN DESIRED TEMP. COEFF.

SOM-5C	CA-018612	1
PRODUCT	NEXT ASSEMBLY	QTY. ASSY.

DATA CONTROL SYSTEMS, INC.

TITLE: BOARD ASSY, MASTER

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN /IN.
FRACTIONAL HOLES .0 + 1/64
NOTE: BREAK ALL SHARP CORNERS .005"-.015"
SURFACE ROUGHNESS NOT TO EXCEED

		DATE
DWN. G.R.		11/2/69
CHKD.		11/2/69
ENG.		11/2/69
APP.		11/2/69
SCALE		

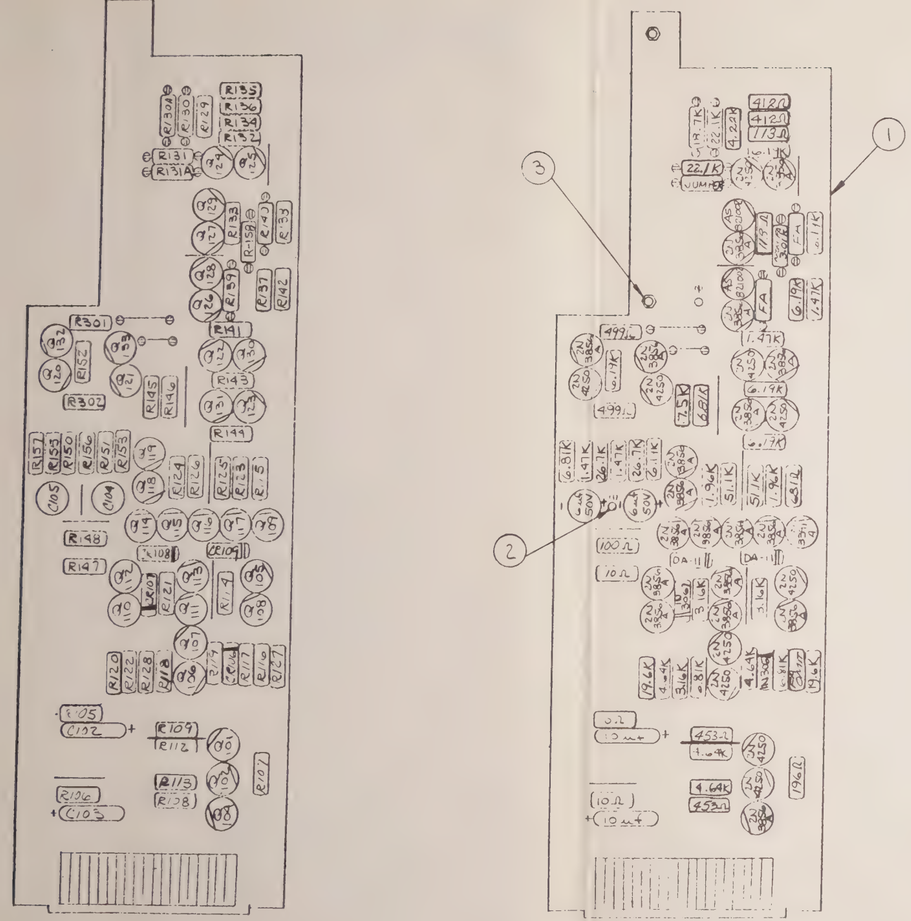
DO NOT SCALE DRAWING

MAT'L

FINISH

GA 018615 REV. E

SHEET



ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY REQ'D
	C127		TRANSISTOR, G.E. 2N3856A.	1
*	Q128 Q129	AS-821002	Transistor, MATCHED PAIR	1
				1
	C130		Transistor, G. E. 2N3856A	1
	C131		2N3856A	1
	C132		2N3856A	1
	C133		2N3856A	1
2		Jumper	#22 Buss (Z) type	A/R
3	AD	AD-010715	Pat. Guide	2
	Q101		Transistor. Motorola 2N4250	1
	Q102		2N4250	1
	Q104		Transistor G. E. 2N3856A	1
	Q105		Transistor Motorola 2N4250	1
	Q106		2N4250	1
	Q107		2N4250	1
	Q108		Transistor. G. E. 2N3856A	1
	Q109		2N3856A	1
	Q110		2N3856A	1
	Q111		2N3856A	1
	Q112		2N3856A	1
	Q113		2N3856A	1
	Q114		2N3856A	1
	Q115		2N3856A	1
	Q116		2N3856A	1
	Q117		2N3856A	1
	Q118		2N3856A	1
	Q119		2N3856A	1
	Q120		Transistor. Motorola 2N4250	1
	Q121		2N4250	1
	Q122		2N4250	1
	Q123		2N4250	1
	Q124		2N4250	1
	Q125		Transistor. G. E. 2N3856A	1
	Q126		2N3856A	1

ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY REQ'D
	CR116		Diode, Conv. Dev. 1N3067	1
	CR117		1N3067	1
	CR118		Diode, Selector DA-11	1
	CR119		DA-11	1
	R136			
	R301			
	R302			
	R137			
	R138			
	R139			
	R140			
	R141			
	R142			
	R143			
	R144			
	R145			
	R146			
	R147			
	R148			
	R150			
	R151			
	R152			
	R153			
	R130A			
	R154			
	R156			
	R157			
	R131A			
	R158			
	C102			
	C103			
	C104			
	C105			

PART NO.	DESCRIPTION	QTY REQ'D
	RES WL, RN60C, 1/4W, 1% 412Ω	1
	Res, Electra. MF5C-D 1/4W 1% 499Ω	1
	499Ω	1
	Res, Electra, MF5C-D, 1/4W, 1% 6.19K	1
	6.19K	1
	F/A	1
	F/A	1
	1.47K	1
	1.47K	1
	6.19K	1
	6.19K	1
	Res, WL, RN60E, 1/4W, 1% 75.K	1
	Res, WL, RN60E, 1/4W, 1% 6.81K	1
	Res, AB, CB, 1/4W, 10% 10Ω	1
	Res, AB, CB, 1/4W, 10% 100Ω	1
	Res, Electra, MF5C-D, 1/4W, 1%, 26.7K	1
	26.7K	1
	6.19K	1
	Res, Electra, MF5C-D, 1/4W, 1%. 6.19K	1
	Res, WL. RN60E, 1/4W, 1% F.A.NOM 18.7K	1
	Res, Electra, MF5C-D, 1/4W, 1%, 1.47K	1
	1.47K	1
	6.81K	1
	Res WL RN60C 1/4W 1% F.A.NOM Jump	1
	RES. ELECTRA, MF5C, 1/4W. 1% NOM FA 3.01K	1
	CAP. SPRAGUE, 150D, 20% 20V. 10uf	1
	20V. 10uf	1
	Cap, Gentronics, 101D.BS, 20%, 50V. 6uf	1
	Cap, Gentronics 101D BS, 20%, 50V. 6uf	1

ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY REQ'D
1		DF-018504	Board Fab Master	1
	R105		RES, AB, CB 1/4W. 10% 10Ω	1
	R106		10Ω	1
	R107		Res, Electra, MF5C-D, 1/4W, 1%, 196Ω	1
	R108		453Ω	1
	R109		453Ω	1
	R112		4.64K	1
	R113		4.64K	1
	R114		3.16K	1
	R115		681Ω	1
	R116		FA OMIT	1
	R117	***	Res, T.I., C.G., 1/4W, 1% 6.81K	1
	R118	***	Res, T.I., C.G., 1/4W, 1% 6.81K	1
	R119		Res W.L., RN60C, 1/4W, 1% 4.64K	1
	R120		19.6K	1
	R121		3.16K	1
	R122		4.64K	1
	R123		1.96K	1
	R124		1.96K	1
	R125		51.1K	1
	R126		51.1K	1
	R127		19.6K	1
	R128		3.16K	1
	R129		4.22K	1
	R130		Res T. I. CG 1/4W, 1% FA NOM FA 22.1K	1
	R131		Res, WL, RN60E 1/4W, 1% F.A. NOM 22.1K	1
	R132		Res, WL, RN60C, 1/4W, 1%, 6.19K	1
	R133		113Ω	1
	R134		113Ω	1
	R135		412Ω	1

REV.	DESCRIPTION	DATE	BY	CHK	APP.
B	CA-4929, CHG'D RES. VALUES	2/17/69	GCD	GR	GR
C	CA-5007, DELETED R110 & R111	3-12-69	GCD	GR	GR
D	CA-5027, CHG'D RES. VALUES	4-9-69	GCD	GR	GR

NOTES:

1. * Q128, Q129 ARE MATCHED PAIR 2N4250 PER AS-821002.
2. *** R117, R118 ARE T.I., C.G. ¼, ¼W, 1% RESISTORS TO OBTAIN DESIRED TEMP. COEFF.

GOM-5	CA-018611
PRODUCT	NEXT ASSEMBLY

DATA CONTROL SYSTEMS, INC.

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN /IN.
FRACTIONAL HOLES .0. + 1/64
NOTE: BREAK ALL SHARP CORNERS .005". 016" SURFACE ROUGHNESS NOT TO EXCEED

	DATE
DWN. G.R.	1/2/68
CHKD.	1/2/68
ENG.	1/2/68
APP.	1/2/68
SCALE 2	

TITLE: BOARD ASSY, MASTER

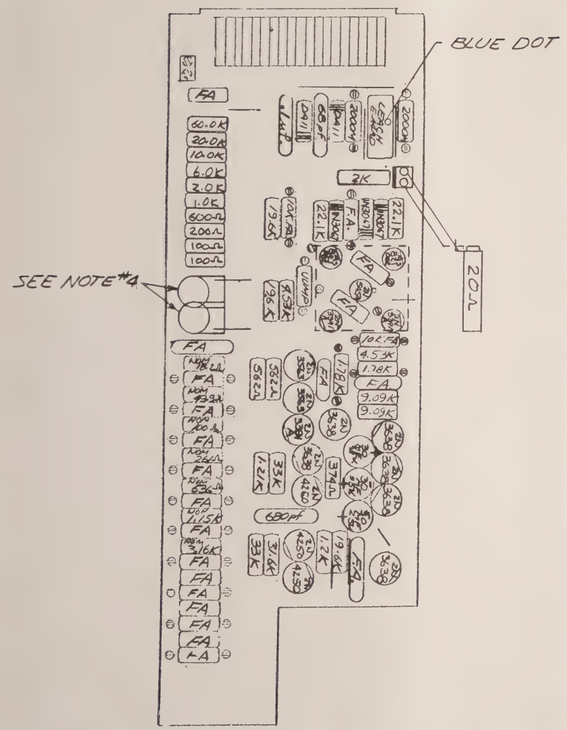
DO NOT SCALE DRAWING

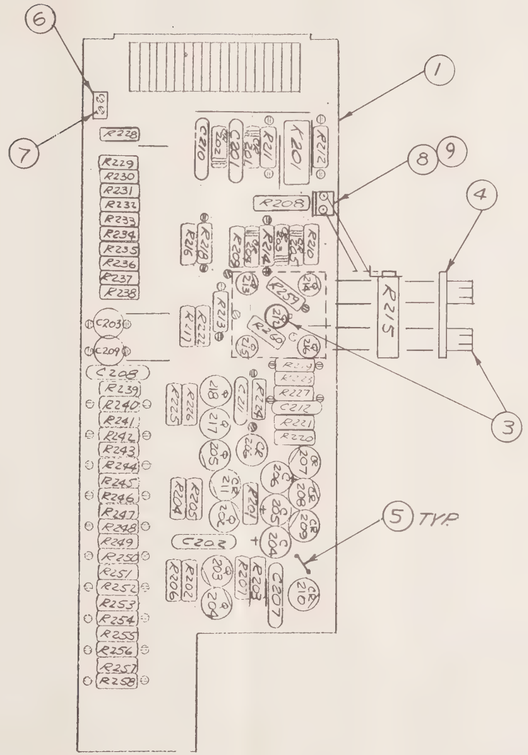
MAT'L

FINISH

GA-018614 REV. D

SHEET





ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY. REQ'D
1		CF-015412	BOARD FAB. PRE AMP	1
	R201		RES, ELECTRA, MF5C-D, ¼W. 1% 374Ω	1
	R202		31.6K	1
	R203		19.6K	1
	R204		1.21K	1
	R205		AB, CB ¼W. 10% 33K	1
	R206		33K	1
	R207		1.2K	1
	R208		POT. BOURNS #3007P-1-202 2K	1
	R209		RES. RN60C, ¼W. 1% 22.1K	1
	R210		RES. RN60C ¼W. 1% 22.1K	1
	R211		IRC GBT ½ 2000 MEG	1
	R212		IRC GBT ½ 2000 MEG	1
	R213		RES, RN60C, ¼W, 1%, NOM JUMP FA.	1
	R214		RES. RN60C, ¼W, 1% NOM JUMP FA.	1
	R215		BECKMAN, HELITRIM, #55-1-BW-R20, 20Ω	1
	R216	*	RES, RN60C, ¼W. 1% 19.6K	1
	R217	*	19.6K	1
	R218		FA. 10K	1
	R219		FA. 10K	1
	R220		9.09K	1
	R221		9.09K	1
	R222		4.53K	1
	R223		4.53K	1
	R224		1.78K	1
	R225		562Ω	1
	R226		562Ω	1
	R227		1.78K	1
	R228		JUMPER NOM.	1
	R229		RES. RCL TYPE, 7006, 0.1% 60.0K	1
	R230		20.0K	1
	R231		10.0K	1
	R232		6.0K	1
	R233		2.0K	1
	R234		1.0K	1
	R235		600Ω	1

ITEM	SYMBOL
	R236
	R237
	R238
	R239
	R240
	R241
	R242
	R243
	R244
	R245
	R246
	R247
	R248
	R249
	R250
	R251
	R252
	R253
	R254
	R255
	R256
	R257
	R258
	C201
	C202
	C203
	C204
	C205
	C206
	C207
	C208
	C209
	CR201
	CR202
	CR203
	CR204

ITEM	SYMBOL

	RES. RCL, TYPE 7006, 0.1%, 200Ω		1
		100Ω	1
		100Ω	1
	RN60C, 1/4W, 1%	18.2 NOM F.A.	1
			1
		49.9 NOM.	1
			1
		100Ω NOM.	1
			1
		261Ω NOM.	1
			1
		536Ω NOM.	1
			1
		1.15K NOM.	1
			1
		3.16K NOM.	1
			1
			1
			1
			1
			1
	RES. RN60C, 1/4W. 1%	F.A.	1
	CAP. DURMICA, DM-10, 100V. 10%	68pf	1
	CAP. DURMICA, DM-10, 100V. 10%	680pf	1
	ERIE TRIMMER, 539-002 COPO988, 1.5-8pf F.A.		1
0-014132	CAP. GENTRONICS, 1010, 25V.	30uf	1
-014132		30uf	1
-014132		30uf	1
	DURMICA, DM-10	F.A.	1
	DURMICA, DM-30, 100V. 1%.	F.A.	1
	SEE NOTE #4		1
	DIODE CONT. DEV.	DA11	1
	DIODE CONT. DEV.	DA11	1
	DIODE CONT. DEV.	1N3067	1
	DIODE CONT. DEV.	1N3067	1

PART NO.	DESCRIPTION	QTY. REQ'D

	CR205		DIODE CONT. DEV. 1N3067	1
	CR206		FAIRCHILD 2N3638	1
	CR207			1
	CR208			1
	CR209			1
	CR210			1
	CR211			1
	Q202		TRANS. FAIRCHILD 2N4250	1
	Q203		2N4250	1
	Q204		2N4250	1
	Q205		G.E. 2N3391A	1
	Q212		UNION CARBIDE, 2N5454	1
**	Q213 Q214	AS-821002	MATCHED PAIR	1
	Q215		TRANS. GE 2N3391A	1
	Q216		G.E. 2N3391A	1
	Q217		FAIRCHILD 2N3563	1
	Q218		FAIRCHILD 2N3563	1
	C210		CAP. RMC, DISCAP, 100V. .1uf	1
3			HEATSINK, I.E.R.C, TXB, 2R019-02BB	5
4		BD-015780	HEATSINK PLATE	1
5			JUMPER WIRES #24 (AWG)	A/R
	K201		RELAY - LEACH, E-A4AD OR	1
			PHILLIPS EQUIV.	
	R259		RES. RN60C, 1/4W, 1% F.A.	1
	R260		RES. RN60C, 1/4W, 1% F.A	1
6		BD-016034	TIE DOWN, BOARD	1
7			SCREW, 4-40NC-2A, R.H.M.S	2
8		BD-015478	BRACKET, POT	1
9		AS-826016-03	EYELET	2
	C211		CAP. DURMICA, DM-10, F.A NOM O.C	1
	C212		CAP. DURMICA, DM-10, F.A. NOM. O.C.	1

ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY REQ'D

REV.	DESCRIPTION	DATE	BY	CHK'D	APP'D
AF	CA-5127, REVISED & REDRAWN	6-27-69	GCD	GR	GR

NOTES:

1) RIVET ITEM #8 TO BOARD COMP SIDE AS SHOWN.
2) * INDICATES MATCHED PAIR R216 & R217 RESISTORS WITHIN 0.1%
3) ** INDICATES MATCHED PAIR 2N4250 TRANS. PER AS-821002.
4) ERIE TRIMMER TO BE MOUNTED IN EITHER C203 OR C209.
5) SCREW LENGTHS TO BE DETERMINED IN ACCORDANCE WITH DCS WORKMANSHIP MANUAL № AS-832011.

GOM-SC-01	CA-018673
FIRST PRODUCT	NEXT ASSEMBLY

QTY. ASSY 1

DATA CONTROL SYSTEMS, INC.

TITLE: PRE. AMP. BD. ASSY GOM-SC-01

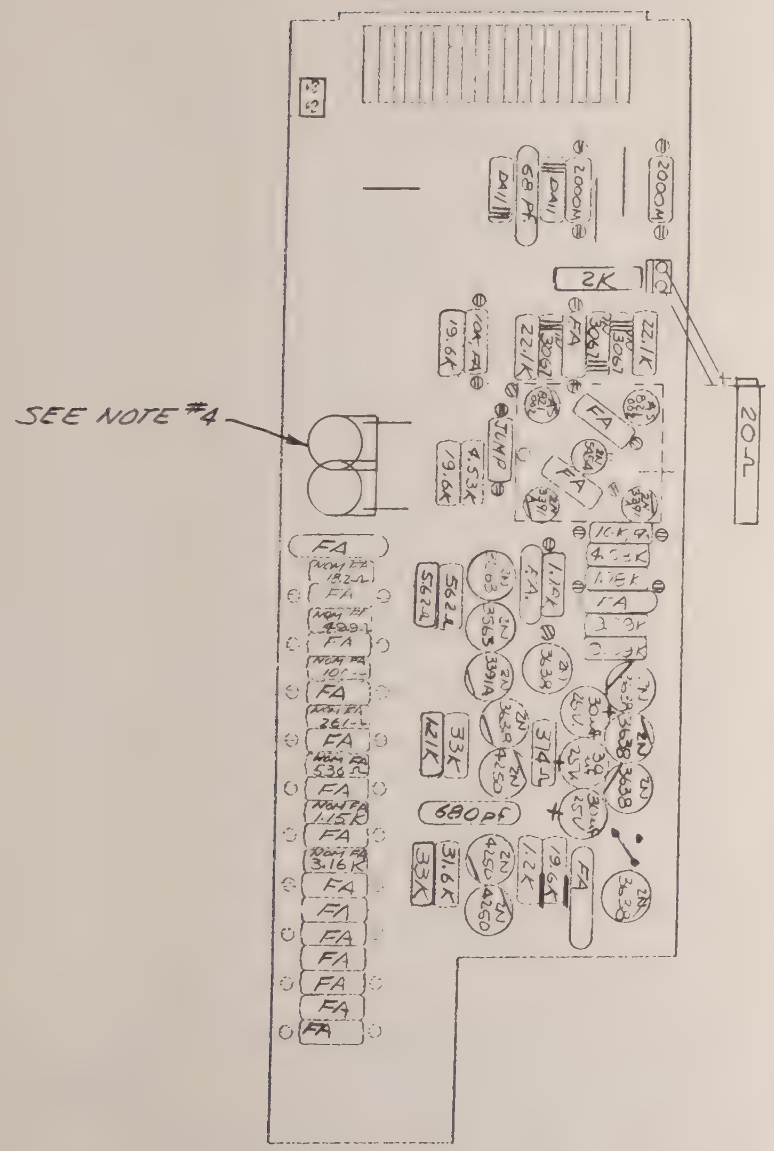
TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN ~ /IN.
FRACTIONAL HOLES .0. ± 1/64
NOTE- BREAK ALL SHARP CORNERS .005"-.015" SURFACE ROUGHNESS NOT TO EXCEED

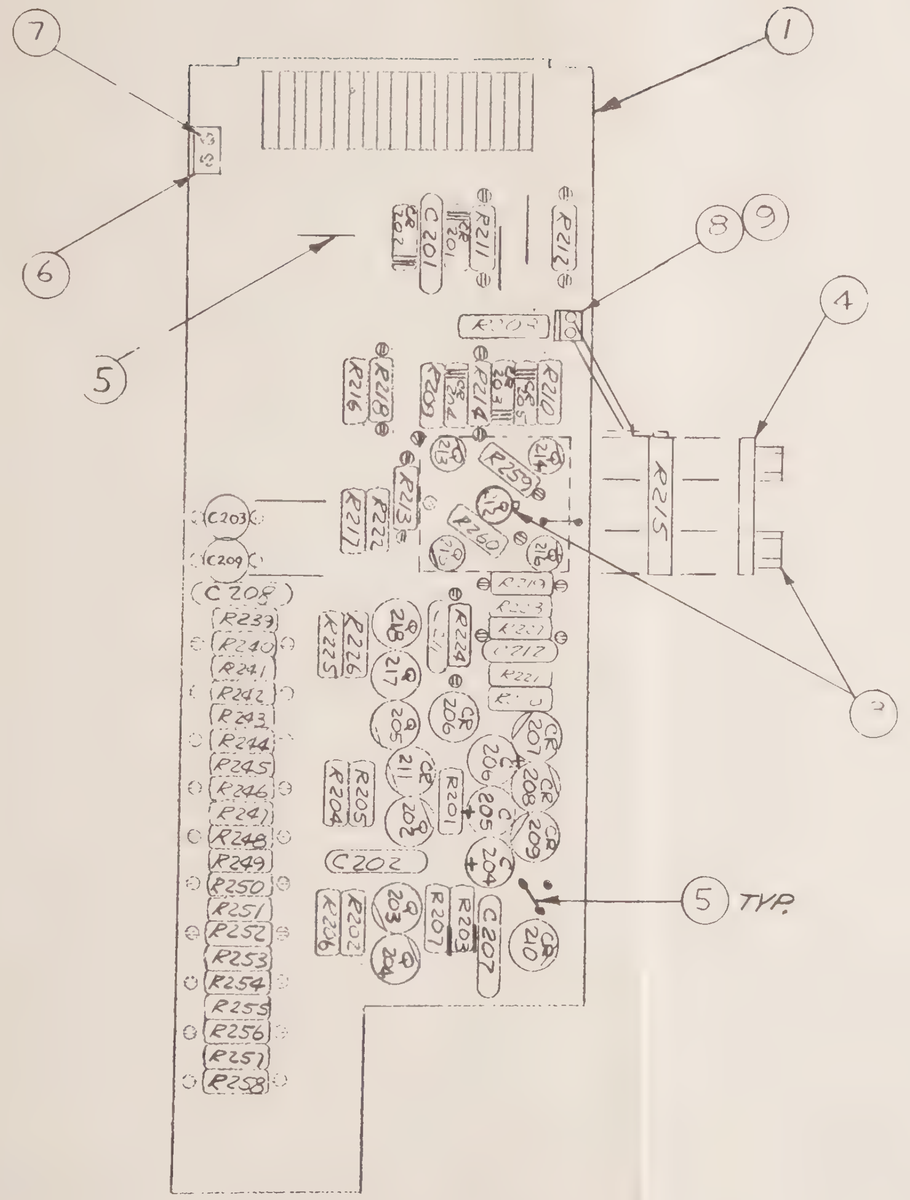
		DATE
DWN.	G. DYER	6-27-69
CHK'D.	GR	7/1/69
ENG.		
APP.		7/1/69
SCALE		

DO NOT SCALE DRAWING
MAT'L
FINISH

GA 015452 REV. AF

SHEET





ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY. REQ'D
		CF-015412	[illegible]	1
	R201		RES. ELECTRA, MF5C-D, 1/4W, 1% [illegible]	1
	R202		[illegible]	1
	R203		[illegible]	1
	R204		[illegible]	1
	R205		[illegible] 33K	1
	R206		33K	1
	R207		12K	1
	R208		POT BOURNS #300[illegible] 2K	1
	R209		RES. RN60C 1/4W [illegible]% [illegible]K	1
	R210		[illegible]K	1
	R211		[illegible] SBT 1/2 [illegible] MEG	1
	R212		IRC, SBT 1/2 [illegible] MEG	1
	R213		RES. RN60C 1/4W [illegible]% [illegible] FA	1
	R214		[illegible] FA	1
	R215		BECKMAN [illegible] #55LEN [illegible]	1
*	R216		RES. RN60C, 1/4W, [illegible]	1
*	R217		[illegible]	1
	R218		[illegible] F.A.	1
	R219		[illegible] F.A.	1
	R220		309K	1
	R221		3.09K	1
	R222		4.53K	1
	R223		4.53K	1
	R224		1.78K	1
	R225		562Ω	1
	R226		562Ω	1
	R227		1.18K	1

ITEM	SYMBOL	PART NO.	DESCRIPTION
	R239		RES. [illegible]
	R240		
	R241		
	R242		
	R243		
	R244		
	R245		
	R246		
	R247		
	R248		
	R249		
	R250		
	R251		
	R252		
	R253		
	R254		
	R255		
	R256		
	R257		
	R258		RES. RN[illegible]
	C201		CAP DU[illegible]
	C202		CAP D[illegible]
	C203		ERIE TRIM[illegible]
	C204		CAP GEN[illegible]
	C205		
	C206		
	C207		CAP DU[illegible]
	C208		CAP DU[illegible]
	C209		(SEE NO[illegible]
	CR201		DIODE [illegible]
	CR202		DIODE [illegible]
	CR203		DIODE [illegible]
	CR204		DIODE [illegible]

				160Ω, 1/4W. 1%, 1.32Ω NOM. FA	1
					1
				49.9Ω NOM.	1
					1
				100Ω NOM.	1
					1
				261Ω NOM.	1
					1
				536Ω NOM.	1
					1
				1.15K NOM.	1
					1
				3.16K NOM.	1
					1
					1
					1
					1
					1
					1
				60Ω, 1/4W, 1% FA	1
				MICA, DM-10, 100V 10% 68pf	1
				MICA, DM-10, 100V 10% 680pf	1
				MER, 539-002-COPO-98R 1.5-8pf. FA	1
				TRONICS, 10/D, 25V 30uf	1
				30uf.	1
				30uf.	1
				MICA, DM-10 FA	1
				MICA, DM-30, 100V. 1% FA.	1
				TE #4)	1
				CONT. DEV. DA11	1
				CONT. DEV. DA11	1
				CONT DEV. IN3067	1
				CONT DEV. IN3067	1
ITEM	SYMBOL	PART NO.	DESCRIPTION		QTY. REQ'D

	CR205		DIODE CONT. DEV. IN3007	1
	CR206		FAIRCHILD 2N3638	1
	CR207			1
	CR208			1
	CR209			1
	CR210			1
	CR211		SIDLE. FAIRCHILD 2N3638	1
	Q202		TRANS. FAIRCHILD 2N4250	1
	Q203			1
	Q204			1
	Q205		G.E. 2N3391A	1
	Q212		UNION CARBIDE 2N5454	1
**	Q213 Q214	AS-8210012	TRANS. MATCHED PAIR	1
	Q215		TRANS. G.E. 2N3391A	1
	Q216		G.E. 2N3391A	1
	Q217		FAIRCHILD 2N3563	1
	Q218		TRANS. FAIRCHILD 2N3563	1
3			HEATSINK, IERC. TXB 2P-019-028B	5
4		BD-015478	HEATSINK PLATE	1
5			JUMPER WIRES #24 (AWG)	A/R
	R259		RES. RN60C, 1/4W. 1% F.A.	1
	R260		RES. RN60C, 1/4W. 1% F.A.	1
6		BD-016034	TIE DOWN, BOARD	1
7			SCREW, 4-40, NC-2A, R.H.M.S.	2
8		BD-015478	BRACKET, POT	1
9		AS-826016-03	EYELET	
	C211		CAP. DURMICA, DM-10, FA NOM. CC	1
	C212		CAP. DURMICA, DM-10, FA NOM. CC	1
ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY. REQ'D

GA-015521 REV AF

REV.	DESCRIPTION	DATE	BY	CHKD	APPD
AB	CA-018127, REVISED & REDRAWN	6-27-69	G.C.D.	JJK	JJP

NOTES:

1) RIVET ITEM #9 TO BOARD ON COMP. SIDE, AS SHOWN.
2) * INDICATES MATCHED PAIR, R216 & R217 RESISTORS WITHIN 0.1%.
3) ** INDICATES MATCHED PAIR 2N4250 TRANS. PER, AS-821002.
4) ERIE TRIMMER TO BE MOUNTED IN EITHER C203 OR C209.
5) SCREW LENGHTS TO BE DETERMINED IN ACCORDANCE WITH DCS WORKMANSHIP MANUAL Nº AS-832011.

G0M-5-03	CA-018682	1
FIRST PRODUCT	NEXT ASSEMBLY	QTY. ASSY.

DATA CONTROL SYSTEMS, INC.

TITLE: PRE. AMP. BD. ASSY. G0M-5-03

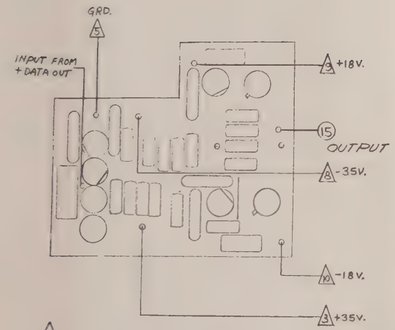
TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN ~ /IN.
FRACTIONAL HOLES -0, + 1/64
NOTE- BREAK ALL SHARP CORNERS .005"-.015"
SURFACE ROUGHNESS NOT TO EXCEED ~

		DATE
DWN	G. DYER	6-27-69
CHKD.	JJK	7/1/69
ENG.		
APP.	JJP	7/1/69
SCALE	—	

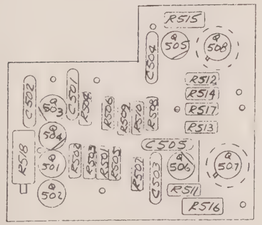
DO NOT SCALE DRAWING
MAT'L —
FINISH —

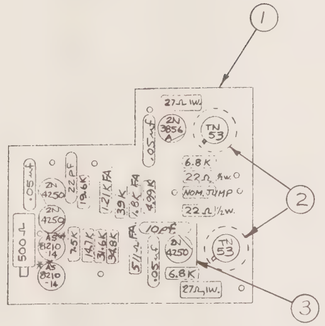
GA 015521 REV. AB

SHEET



△. MASTER BOARD ELCOS.
○. PRE-AMP BOARD ELCOS.





ITEM	SYMBOL	PART NO.	DESCRIPTION	QTY REQ'D
1		CF 015862	BOARD FAB GALVO DRIVER	1
	R501		RES, ELECTRA, MF50AD, ½W, 1%, 31.6K	1
	R502		7.5K	1
	R503		14.7K	1
	R504		19.6K	1
	R505		3.48K	1
	R506		FA 1.21K	1
	R507		FA 511Ω	1
	R508		4.99K	1
	R509		AB, CB ½W, 10% 3.9K	1
	R510		NOM FA 1.8K	1
	R511		6.8K	1
	R512		6.8K	1
	R513		AB, EB ½W, 10% 22Ω	1
	R514		AB, EB ½W, 10% 22Ω	1
	R515		AB, GB, 1W, 10% 27Ω	1
	R516		AB, GB, 1W, 10% 27Ω	1
	R517		AB, GB, 1W, 10% FA (NOM. JUMP)	1
	R518		POT, BOURNS, # 3007P-1-501, 500Ω	1
	C501		CAP DURMICA, DM-10, 100V, 22 pf	1
	C502		RMC, DISCAP TA 50 100V .05 μf	1
	C503		RMC. DISCAP TA 50 100V. .05 μf	1
	C504		CAP RMC. DISCAP TA 50 100V. .05 μf	1
**	Q501 Q502	AS-821014	TRANS DC 5 MATCHED PAIR	1
	Q503		FAIRCHILD 2N4250	1
	Q504		FAIRCHILD 2N4250	1
	Q505		GE 2N3856A	1
	Q506		FAIRCHILD 2N4250	1
	Q507		SPRAGUE TN53	1
	Q508		TRANS SPRAGUE TN53	1
	C505		CAP DURMICA, DM-10, 100V. 10pf	1
				1
2			HEATSINK WAKEFIELD MOD. 204	2
3			WIRE #24 BUSS A/R	1
		**	MATCHED PAIR, AMELCO, 2N4302	

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHKD	APPD
H	CA-5145 REDRAWN & CHG R-518 TYPE.	7-14-67	GCD	GR	GR

GOM-5C-01	CA-018673	1
PRODUCT	NEXT ASSEMBLY	QTY — USED

DATA CONTROL SYSTEMS, INC.

TITLE: 80 ASSY, GALVO-DRIVER GOM-5C-01

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC ± 1/64 ANG ± 0°30'
FLATNESS WITHIN .001 IN
FRACTIONAL HOLES .0 + 1/64
NOTE: BREAK ALL SHARP CORNERS .005", .015" SURFACE ROUGHNESS NOT TO EXCEED √

DWN G. DYER 7-14-67
CHKD GR 7/15/67
ENG
APP
SCALE —

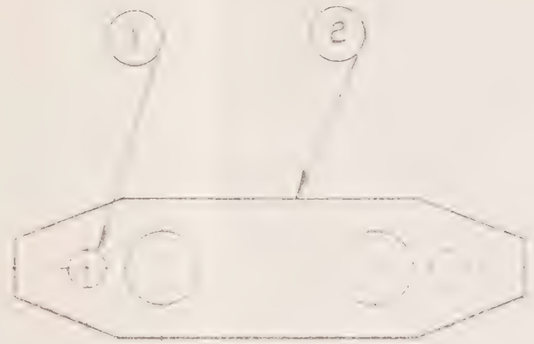
DO NOT SCALE DRAWING
MAT'L —
FINISH —

TA 015863 REV H
SHEET

REV	DESCRIPTION	DATE	DWN	CHK	APP

BD-014182 REV A

ITEM	SYMBOL	DWG NO	DESCRIPTION	QTY / ASSY
1		AS-826002-A-02	BUTTON, BEARING	2
2		BD-014179	SWITCH LEVER	1



REF	DESCRIPTION	QTY

PRODUCT	NEXT ASSEMBLY	QTY. / ASSY
GOM-5	CA-014269	1

DATA CONTROL SYSTEMS, INC.

TITLE: SWITCH LEVER ASSY.

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN ~ /IN.
FRACTIONAL HOLES -0, + 1/64
NOTE: BREAK ALL SHARP CORNERS .005"-.015"
SURFACE ROUGHNESS NOT TO EXCEED ~

		DATE
DWN	RC	1-25
CHKD	RAT	12/8/65
ENG		
APP	RT	2/6/67
SCALE	2X	

DO NOT SCALE DRAWING

MAT'L

FINISH

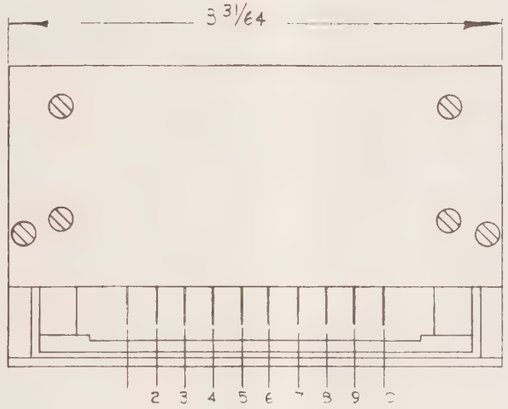
BA-014182 REV A

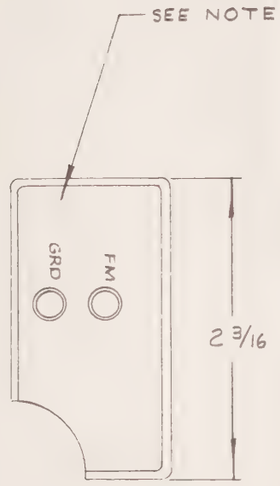
SHEET

REV.	DESCRIPTION	DATE	DWN.	CHK.	APP.

REV.

ITEM	SYMBOL	DWG. NO.	DESCRIPTION	QTY./ASSY





NOTES:

1. See Schematic Drawing #CW-015014 for reference pin numbers.
2. The GOM-5/F plugs into the side of the GOM-5 through mating Elco connector pins.
3. End cap contains appropriate frequency and other pertinent information.

REF.	DESCRIPTION	QTY

GOM-5/F		1
FIRST PRODUCT	NEXT ASSEMBLY	QTY./ASSY.

DATA CONTROL SYSTEMS, INC.

TITLE: OUTLINE DWG.

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN ~ IN.
FRACTIONAL HOLES -0. + 1/64
NOTE- BREAK ALL SHARP CORNERS .005"-.015"
SURFACE ROUGHNESS NOT TO EXCEED ~

		DATE
DWN.	WB	6/6/66
CHKD.	EH	6/6/67
ENG.	GM	
APP.	RT	6/16/67
SCALE	~	

DO NOT SCALE DRAWING

MAT'L ~

FINISH ~

BO-014582 REV. A

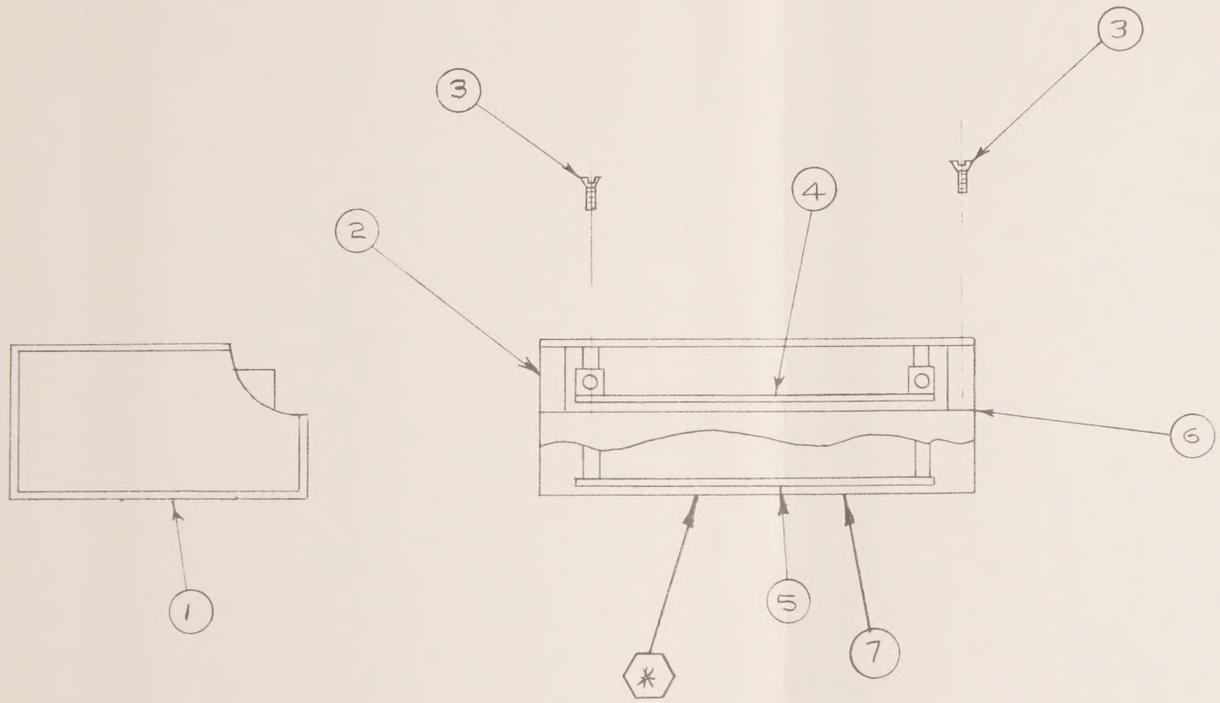
SHEET

REV.	DESCRIPTION	DATE	DWN.	CHK.	APP.
B	CA-3964 ADD NOTE ⑧ & CALLOUT TO DWG; ADD ITEM #7	10/27/67	[illegible]	[illegible]	[illegible]
C	CA-4693 CHG'D ITEM # 4 & 5	8/7/68	[illegible]	[illegible]	[illegible]

B

REV.

ITEM	SYMBOL	DWG. NO.	DESCRIPTION	QTY./ASSY.
1		CD-013865	CHASSIS, PLUG-IN	1
2		BD-010728	END PLATE	1
3		AS-826026*26	SCREW, 2-56 ** FHMS	A/R
4		CA-016190	BOARD ASS'Y., TIMING	1
5		CA-016190	BOARD ASS'Y., FILTER	1
6		BA-015034	END CAP ASS'Y.	1
7		BD-013361	NAMEPLATE	1



NOTES:
1) * = LATEST REVISION
2) ** = SCREW LENGTHS TO BE DETERMINED IN ACCORDANCE WITH DCS WORKMANSHIP MANUAL #AS-832011.

(*) STAMP UNIT APPROX AS SHOWN. "FILTERD" WHEN DEVIATION IS ≥ 4.7% BUT ≤ 16%. "UNFILTERED" WHEN DEVIATION IS OTHER THAN ABOVE, UNLESS OTHERWISE SPECIFIED.

REF.	DESCRIPTION	QTY

60M-5/F

PRODUCT	NEXT ASSEMBLY	QTY./ASSY.

DATA CONTROL SYSTEMS, INC.

TITLE: FINAL ASS'Y. TIMING

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL - 3 PLACE ± .005
DECIMAL - 2 PLACE ± .010
FRAC. ± 1/64 ANG. ± 0°30'
FLATNESS WITHIN ~ /IN.
FRACTIONAL HOLES -0. + 1/64
NOTE- BREAK ALL SHARP CORNERS .005"-.015"
SURFACE ROUGHNESS NOT TO EXCEED √

		DATE
DWN. DR		5/31/66
CHKD. [illegible]		6-2-66
ENG. RTM		2/16/67
APP. RT		2/16/67
SCALE FULL		

DO NOT SCALE DRAWING
MAT'L ~
FINISH ~

BA-01457G REV. C

SHEET